1888.

Borough of Cardiff.

REPORT

ON THE

Sanitary Condition of Cardiff

FOR THE YEAR 1887,

BY

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CARDIFF,

JANUARY 31st, 1888.

TO THE
Cardiff Urban Sanitary Authority.

Gentlemen,

As this will be the last occasion on which I shall have to address you as your Medical Officer, it may be deemed desirable I should detail, as concisely as possible, the disturbing causes that have acted more seriously on the public health (as these came under my personal observation) during the many years it has been my privilege to advise the Local Authority; the means taken to remove them, and the success attending them; that, in pointing out all that has been and what remains to be done, you may, from the experience gained from the history of the past, learn the lines of sanitation to be followed in the future, and, at the same time also, it will make this Report complete in itself.

The Urban Sanitary District of Cardiff contains within itself all the essentials necessary to afford information on matters associated with Hygiene, as it comprises an area of 8,409 acres of diverse surface configuration and geological conformation. That portion built over, centrally situated and compact, with no suburbs or houses in the ordinary acceptation of the term, has a large population, admitting of well defined classification as to residence and occupation, and this will be seen in the short resume which I propose to make of the chief causes affecting the healths and the mortality of the inhabitants.

EPIDEMICS.

In 1839, owing to a temporary appointment I then held, a considerable portion of the sick poor in this town were committed

to my charge. It soon became known to me that there were certain localities in Cardiff where undue sickness prevailed, and that in the houses, and from amongst the families of the Irish labourers, typhus fever was rarely absent. At this time some attention was beginning to be directed to public health, and the Health of Towns Commission was appointed to enquire into the sanitary condition of the people of England. Of this commission Mr. CHADWICK was a most active member, and very valuable information was obtained eventuating in the passing of the Public Health Act of 1848. At this time, feeling a great interest in the subject, I made myself acquainted with the circumstances under which Typhus Fever prevailed so extensively, and almost exclusively, amongst the class in this district to which I refer. Typhus Fever is the most infectious of zymotic diseases; it is communicable from the sick to the healthy in breathing the atmosphere poisoned with the exhalations from the bodies of those suffering from this disease; under such circumstances, few escape who are exposed to such influences. Upon making my enquiries I elicited the following facts.

For some time a very considerable number of Irish labourers of the lowest class had been attracted here, due to the open field for employment afforded by the extensive public works then being carried out in this locality; house accommodation was utterly inadequate to meet their requirements, over-crowding necessarily resulted; the sleeping apartments were never empty and no ventilation could be effected, as beds vacated by those proceeding to work were immediately occupied by relays returning. To such an extent did over-crowding obtain that it was not uncommon to find adults of both sexes occupying the same sleeping rooms; all decency and self-respect were gone. There was no attempt at cleanliness; filth and wretchedness marked the condition of their miserable houses. I had, therefore, no difficulty in determining the prevalence of this disease to the cause I have just described, and I communicated these facts to the only authorities then in existence (the Streets and Pavement Commissioners), and I was asked to advise them on the subject, but so limited were their powers that little could be done beyond treatment to the sick, and effecting, so far as possible, cleanliness; but, in 1846-7, on the failure of the potato crop, it broke out in the Sister Island in such a terrible form as to be called the "Famine Fever of Ireland. It prevailed especially in parts in constant communication with this port, owing to the coasting trade that then existed between the two countries, and the panic-stricken peasantry, in their desire to escape the perils that surrounded them on every side at home, migrated, and sought shelter amongst their kindred located in the already over-crowded houses of this town; and, as a result, the epidemic broke out with such a fearful fatality here, that, within a few months, 170 deaths were registered from this district. With such intensity did the

fever rage that it became necessary to apply to the War Office for permission to utilise the Depôt Barracks at Longcross (at this time unoccupied), as a fever hospital. This and other epidemics have been more fully described in a report made to your board in 1885.

This epidemic caused much alarm, and as an anxiety, too well founded, existed in the public mind of an impending and more serious visitation, I moved the Local Authority to seek the intervention of the General Board of Health. This course eventuated in a most careful and exhaustive enquiry into the sanitary condition of the town by an Assistant Commissioner. The consequent report thereon described the existence of most serious evils. Amongst others, it especially pointed out the entire absence of drainage, with a dangerously polluted water supply; also revealing the astounding fact, that the mean annual death-rate of the immediately preceding ten years was 30 per 1,000 of the inhabitants, and that the total deaths registered exceeded the births. A provisional order was then issued, and subsequently confirmed, placing the town under the provisions of the Public Health Act.

In this, and all previous Annual Reports, the term "death-rate" is constantly brought before your notice, and I desire again to impress upon your mind that, as this constitutes an important factor when dealing with the condition of a locality, the hypothesis adopted by the Registrar General is not applicable in its entirety to your district, and I still further illustrate this inapplicability by other new, direct, and collateral facts.

When the census is taken, no difficulty is experienced in fixing an accurate birth and death-rate, but subsequently, until another census is taken, the estimate is only an approximate one, and, generally, this is satisfactory. There are, however, exceptional districts, where disturbing causes would lead to most important errors. I have already indicated this by stating, as an axiom, that the yearly increment of a kingdom is due to the excess of births over deaths, in fact, the natural increment (emigration and immigration, as affecting this kingdom, vary so little yearly as to be a matter of no consideration); but in certain urban districts, of which Cardiff constitutes possibly the most important one, above the natural increase, there is a large and varying influx of new comers, attracted here in consequence of the large commercial, manufacturing, and business-like enterprises carried on. Other, therefore, and more reliable hypothetical formula need to be worked out, and to illustrate this necessity, I submit for your consideration the following tables. Table A gives the various census since 1801, with the total population according to each return, and the per-centage increase over that preceding.

Table A.

Year	Population	Increase	Per-centage Increase
1801	1,870	...	...
1811	2,577	707	27·4
1821	3,521	944	26·8
1831	6,187	2,666	43·0
1841	10,077	3,890	38·6
1851	18,351	8,274	45·0
1861	52,054	13,703	42·7
1871	39,536	7,482	18·9
1881	85,378	25,842	30·2

This table clearly shows what I have already pointed out, the variable increment of each decennial period and that this is due to special marked disturbing causes.

In 1837, the Registration Act came into operation, and between 1841 and 1881 I give the several census returns, the population, the births, the deaths, increase due to excess of births over deaths, and increase due to immigration, also total increase.

Table B.

Year	Population	Births	Deaths	Excess of Deaths over Births	Increase due to excess of Births over Deaths	Increase due to Immigration	Total Increase
1841	10,077	...	...	...	...	...	...
1851	18,351	4,032	4,549	517	...	...	8,274
1861	32,054	11,345	7,563	...	3,782	9,921	13,703
1871	29,536	13,677	8,753	...	4,924	2,558	7,482
1881	85,378	24,380	13,359	...	11,021	14,821	25,842

The above table shews that in 1841 the population of Cardiff was 10,077; in 1881 it had risen to 85,378, being an increase of 75,301; to this increase the excess of births over deaths gave 19,727, immigration of new comers 28,300.

An additional hypothetical formula recently approved by the Registrar General is as follows. An official return is obtained from the overseers, of the total number of houses rated to the poor on the 30th June of each year. On referring to the census returns of 1861, 1871, and 1881, these give the total population and the total number of inhabited houses; dividing the population by the houses gives the mean of inmates to each house, these three periods gave a mean varying from 5·25 to 6·75. In the middle of the present year I obtained a return from the overseers of the total number of houses at this time rated to the poor. I then took 6·25 as the probable mean, that being the lowest of the three; because, from the extraordinary number of houses built in Cardiff, the increased house accommodation enabled the houses to become less

overcrowded (the mean of inmates is here greater than that of the Kingdom, that being 5·0). This arises from the circumstance, that practically, all houses here are built on lease tenure; the ground rent being high eventuates in these houses being so constructed as to accommodate two or more families, and, probably, more than three-fourths of the houses are so occupied. The following is the return for the year as obtained from the overseers.

No. of inhabited houses,			St. Mary	Parish	...	4249
"	"	"	St. John	"	...	4139
"	"	"	Roath	"	...	5348
"	"	"	Canton	"	...	4634
						18,370

According to this return the population for Cardiff for the present year may be estimated

The report of the Assistant Commissioner is invaluable, from the circumstance that it was made at the time when sanitation, even in a most elementary form, did not exist, and it serves us as a standpoint to estimate the value of the vast and important sanitary operations that have since been carried out, and shows the successive improvements that have taken place in the general health of the inhabitants, as seen by the decreasing mortality. To illustrate this see Table C. This table shows the population, the births, deaths, excess of deaths over births, and the excess of births over deaths annually.

Table C.

Year	Population	Births	Deaths	Excess of Deaths over Births	Excess of Births over Deaths
1845	13,385	320	324	4	
1846	14.212	381	321		60
1847	15,039	331	484	153	
1848	15,866	428	579	151	
1849	16,693	466	864	395	
1850	17,520	504	485		19
1851	18,354	575	585		50
1852	19,724	696	620		76
1853	21,094	865	644		221
1854	22,464	950	925		25
1855	23,834	1079	641		438
1856	25,204	1227	772		455
1857	26,574	1367	883		484
1858	27,944	1356	753		603
1856	29,314	1336	826		510
1860	30,684	1346	662		584
1861	32,054	1223	837		386
1862	32,804	1267	695		573
1863	33,552	1302	862		440
1864	34,300	1369	932		467
1865	35,048	1382	867		515
1866	35,796	1331	882		449
1867	36,544	1397	873		524
1868	37,292	1387	843		544
1869	38,640	1414	1005		409
1870	38,788	1406	903		503
1871	39,536 ~~59,494~~	1391	891		500
1872	40,284 ~~62,086~~	1358	916		442
1873	41,032 ~~64,674~~	1430	995		435
1874	41,780 ~~67,262~~	1550	885		665
1875	69,850	2716	1547		1169
1876	72,438	2707	1455		1252
1877	75,026	2772	1475		1297
1878	77,614	2795	1468		1327
1879	80,202	2969	1428		1541
1880	82,790	2893	1634		1295
1881	85,378	3145	1556		1589
1882	88,603 95,168	3399	1724		1675
1883	91,204 97,767	3526	1807		1719
1884	93,468 100,033	3920	2250		1670
1885	97,034 103,599	4164	2481		1683
1886	100,736 107,301	4270	2269		2001
1887	104,580 ~~111,145~~	4277	2280		1997

I may here explain that in 1871, 1872, 1873, and 1874, two populations are named, the necessity for this arises from the circumstance that in the year the two suburban sanitary districts of Roath and Canton were absorbed into your district, and the first estimate of each year represents that of Cardiff alone, the second that of Cardiff with the two incorporated sub-districts. After that year the estimate is for the newly-constructed district of Cardiff. Again two populations are mentioned every year after 1881—at this time an enormous increase of immigration took place. The first of the two populations from 1882 to 1887 represent the estimate of the Registrar General, based on the hypothetical formula as applied to the entire Kingdom; the second, on the total number of houses and mean of inmates. The latter is no doubt the proper estimate, as it is, in fact, admitted by the Registrar General as probably the most accurate. It is borne out by a foot-note inserted in each of his weekly returns of births and deaths.

As regards the value of death-rates and the importance to be attached to them, it will be desirable to define that which may be considered the normal death-rate, or due to causes other than preventible by sanitary operations. Eminent authorities who treat on this subject state that at least 25 per cent. of total deaths are are due to disturbing causes; these are deaths from zymotic diseases, and no results can be considered entirely satisfactory until these causes have been entirely removed. Now, I take it as a matter of my experience, that all deaths above 15 per 1,000 are abnormal. The returns of annual mortality in this district, for a period exceeding 40 years (as seen in table C), bear out this deduction, and is singularly in accord with the words of the Psalmist, so beautifully expressed in our burial service. "The days of our age are three-score years and ten; though men be so strong that they come to four-score years; yet is their strength then but labour and sorrow; so soon passeth away, and we are gone."

I may thus clearly illustrate this; take a 1,000 births, allowing a mean of 15 per 1,000 dying every year, the whole would have passed away in 70 years.

But it is not alone that an improved sanitary condition of a district will reduce the mortality from zymotic diseases, but by improving the general health of the people, it will minimise deaths due to constitutional causes, such as scrofula, phthisis, and infantile debility.

To remove the exciting causes of disease, such as described in the Assistant Commissioner's Report, the most important ones (a drainage and water supply) necessarily occupied a considerable time, but, as I was immediately appointed Medical Officer of Health, my attention was directed to the serious evils I have already described due to the filthy and over-crowded condition of houses occupied by

the poorer classes, and which gave rise to the prevalence of typhus fever in an alarming form. I therefore took immediate action to abate these serious evils.

Bye-laws having been framed (some of them applicable to common lodging-houses) and a staff placed under my control, these houses were required to be registered, and the cubic contents of each sleeping-room measured. To each room was allotted its number of occupants, a minimum space of 350 cubic feet for each inmate. No beds were allowed on the basement floor; the bed-rooms were required to be unoccupied during the day, the windows opened, so affording necessary ventilation; the bed-clothing reflected over the backs of chairs placed at the foot of each bed; the floors washed at frequent intervals, and walls and ceilings limewashed at fixed intervals (the occupiers, on application, were granted the loan of a brush and bucket, a large number being kept in store for that purpose). These regulations have been enforced from that time until the present with great success.

Your Inspectors of lodging-houses are required to make day and night visits to all lodging-houses, and to see that the above regulations are properly carried out, and it is also the duty of these officials to furnish me every morning with a report showing the result of their inspection of the previous 24 hours, as follows :—

Table D.

MORNING REPORT of Inspector of Lodging-Houses and Nuisances to Officer of Health.

December 19th, 1887.

Street.	No	Name of Occupier.	Number of Families.	Inmates.			Remarks.
				Adults.	Children.	Total.	
Janet	1	J. Thomas	1	2	4	6	Clean
,,	3	T. Wray	2	4	2	6	,,
,,	5	T. Rose	2	4	4	8	,,
,,	7	P. Elston	1	2	4	6	Dirty W.C. Pan
,,	9	G. Rees	2	4	4	8	Clean
,,	11	J. Ross	2	4	5	9	Dirty Yard
,,	13	G. Waker	1	2	5	7	Dirty W.C. Pan
,,	15	T. Green	1	2	4	6	Clean
,,	17	B. Tray	2	4	4	8	,,
,,	19	A. Frost	2	4	5	7	W.C. Choked
,,	21	C. Wellton	1	2	4	6	Clean
,,	23	A Beynon	2	4	4	8	,,
,,	25	G. Stone	2	4	2	6	,,
,,	27	S. Phillips	2	4	4	8	,,
,,	29	C. Charley	2	4	4	8	,,
,,	31	F. Green	1	2	5	7	Accumulation of Rubbish
,,	33	H. Goodman	2	4	2	6	Dirty W.C. Pan
,,	35	D. Williams	1	2	4	6	Clean
,,	37	F. Crane	1	2	4	6	Flags in Yard Broken
,,	39	D. Murphy	2	4	3	7	Clean
,,	41	C. Wray	2	4	4	8	,,
,,	43	B. Rosser	2	4	1	5	Dirty W.C. Pan
,,	45	G. Thomas	1	2	6	8	Clean
,,	47	C. Van	1	2	1	3	,,
,,	49	D. Elsworthy	2	4	5	9	,,

Signed, A. E. LEYSHON,
Inspector, Roath District.

In all cases of non-compliance on the part of the lodging-house keeper, a notice was served on him (or her) to enforce obedience, a very limited period being allowed to comply with the term of notices; failing this, proceedings were immediately taken before the Magistrates, and, as penalties to a greater or less extent, according to the nature of the offence were imposed, in course of time all notices were obeyed without delay, and the success that attended these regulations are to be inferred from the following table.

Table E.

Year	Population	Total Deaths from Fever	Death-rate.
1847	15,039	72	4·7
1848	15,866	21	1·3
1849	16,693	49	3·0
1850	17,520	34	1·9
1851	18,354	35	1·9
1852	19,724	44	2·2
1853	21,094	38	1·8
1854	22,464	18	0·8
1855	23,834	10	0·4
1856	25,204	15	0·5
1857	26,574	20	0·7

This table shows that in 1847 the total deaths registered from fever were 72, giving a death-rate of 4·7 per 1,000 inhabitants. Immediately the regulation of lodging-houses, just described, were enforced, this mortality fell to a very low minimum, the mean of the subsequent ten years being 1·4, showing a diminished mortality from that disease of 300 per cent.

The improvement has continued up to the present time, and on the occasion of a death from fever being registered, I have visited each case and have ascertained that, with very rare exceptions, the form of fever was enteric and not typhus.

Practically, since 1849, typhus, as an epidemic in this town, has been almost unknown. In 1885 only was it found to exist. On that occasion it was due to the breaking-out of the disease in an over-crowded house in Carpenter's Arms Court. The houses in this court were not lodging-houses, but some of them had only a basement and bedroom, with no through ventilation, no backlet of any kind, and although containing only one family they were necessarily overcrowded. When my attention was called to the first house, there were lying in one room eight cases of the disease. It broke out in such an infectious form that it rapidly spread into other houses in close contiguity, or where visitation of the occupants of an infected house had occurred.

This epidemic was fatal in nine cases; the total number of sick cases were 51.

This recent visitation unmistakably appeals to the necessity of a still constant inspection of all houses likely to be overcrowded or otherwise in an unsatisfactory condition, and I have now to impress on you the number of houses of this description existing at the present time. From a very careful enquiry, I have reason to know that the Irish population of Cardiff probably exceeds 13,000; the number of houses occupied by them exceed 2,000. Although much has been done to improve the condition of these houses, much still remains to be done.

From a recent inspection of houses in the localities in this town which I desire to bring under your attention (it is true many have been swept away and replaced by wide strects and lofty buildings; I may instance Whitmore Lane, Charlotte Street, The Hayes, and others), but Stanley Street, Mary Ann Street, Love Lane, and some courts still remain, and should be removed. I will instance the result of my recent visitation to Stanley Street. This street is simply a narrow alley about ten feet in width, with a gully through the centre to carry off the surface-water, and oftentimes in a filthy state; it contains 31 houses, some of them have only a basement floor and bedroom, no backlet of any kind; they are constantly overcrowded unless watched. Dark and gloomy inside, no through ventilation, no water-closet or privy accommodation; the only convenience for this purpose is one common to four or five houses, and this has to be used by adults and children of both sexes to an exclusion of all decency, being on the pan and syphon system, and, as a consequence, frequently found to be more or less in a filthy condition, yet the rents of the houses in this street vary from 4/6 to 6/6 per week. A similar state of things exists in many houses in Love Lane, and but little better in Mary Ann Street. Houses in the latter street are appropriated for the reception of casuals and vagrants, and, therefore, at all times liable to the introduction of infectious diseases. I need hardly point out the danger consequent thereon, when so introduced into such houses, where isolation or separation of the sick from the healthy cannot be enforced. There are many streets and courts of a similar description in this town, and I have urgently to submit for your consideration the desirability of obtaining compulsory powers for the purchase, by arbitration, of such localities. I consider these houses to be utterly unfit for human habitation, and should be swept away. Independent of the benefits to be obtained from this sanitary standpoint, there are others, even an advantage socially, publically, and economically, which would certainly result. Sweep away Mary Ann Street, Stanley Street, Love Lane, Little Frederick Street, and David Street, and open a communication to Charles Street through Nelson Terrace, and these would lead to the construction of two or more wide streets, with more pretentious houses or shops, and constitute a most desirable highway to the East

Moors, where important industries at present exist and others contemplated; and the inhabitants from those old streets might migrate to other localities in the town, with wide streets in front and backlets behind affording a breathing space, in houses to be had at little more if at all exceeding the rent of those they quit; or it might be that a company could be formed to erect blocks of lodging-houses, simple in structure and elevation, with all necessary sanitary arrangements (as is done in other towns) where even a lower rent would meet the requirements of the tenants and would give a fair dividend to the proprietary, and would render them unnecessary to be occupied by more than one family to meet the rent.

At the time the local enquiry was conducted, the town was visited by the severe epidemic of cholera. This epidemic confirmed in its widest sense all the dangers to be apprehended from the absence of drainage and a polluted water-supply. On its appearance, every measure that anxious care and science could suggest was enforced with ceaseless activity. It was recognised that the disease spread amongst those breathing the atmosphere of the infected chamber charged with the exhalations arising from the excretal or other discharges of the sick; or in drinking the water contained in the shallow wells, constructed in the light porous subsoil, into which percolated the liquid contents of the cesspits in close proximity to them, loaded, at this time, with infected matters, and thus imperiling the lives of all those who drank it. As if to mark this result, the violence of the epidemic extended along the line from East to West where the clay deposit ceased and the porous gravel formation commenced, preventing the escape of subsoil water, causing this part of the district to be water-logged, and intensifying the evils I have just described, which the limited means available rendered it impossible to overcome, but all that could be done was done.

A temporary hospital was erected in what was then called "Ten-Acre Field," on the East side of the Gaol wall, now covered with houses. Into this hospital all the sick admitting of removal were conveyed; still, it most frequently occurred that one after another of the inmates remaining in the infected house succumbed to this disease, despite all means adopted to avert this calamity. Medical aid was made available, depôts for dispensing and affording medicine to all who made application were established in various parts of the town, as also others where medical comforts such as wines, spirits, and special articles of diet might be obtained free of cost.

The severity of the disease may be estimated when it is known that 351 deaths were registered as caused by it within four months. The epidemic did not pass away until the advent of the winter months.

In 1854 the town was again visited by cholera. Profiting by the experience of the previous experience, and the result of attention given to the specific nature of the disease by eminent hygieinists, I advised the local authority to adopt a different action as regards the management of the sick. The temporary hospital was still in existence; this was put into proper repair, and, on a case of cholera being reported to me, I caused the healthy to leave the infected house, and, probationary, until they could obtain other quarters, they were received into the building formerly used as a hospital. A staff of nurses were immediately appointed, and I took charge of the patients. The discharges from the patients were received into vessels containing concentrated solutions of chemical disenfectants, such as chloride of lime, carbon of lime, and burnt solution of carbolic acid before disposal. On the termination of the case, I took possession of the house and did not allow it to be re-occupied until the floors, walls, and ceilings were well scraped, cleansed, and saturated with one of the re-agents I have just named. Each room of the house was (night and morning) exposed to the action of chloride gas, given off by adding a small but equal quantity (say two tea-spoonfuls) of binoxide of maganese and chloride of sodium (common table salt) contained in a saucer or plate, a similar quantity of strong sulphuric acid, with a little water.

It was satisfactory to know, by this management, that no second case of cholera occurred in the same family where these precautions were carried out; nor could I find, on a careful enquiry, that the disease was communicated to others by those removed from the house and who had, provisionally, been lodged in what might now be called the temporary home in the ten acre field. The beneficial result of this action can be estimated that on this occasion, with a largely increased population, the mortality fell to 172.

Concurrent with the system of drainage a Company was formed to furnish a new water-supply, and in 1856, this became available.

In 1866 cholera again visited this town, but these two reforms having long before been effected, although the individual cases were quite as severe (the population now reaching 35,796), the total deaths from this disease fell to 44; the same sanitary precautions adopted in 1854 were repeated this year.

A more detailed description of these several epidemics are contained in my report for 1885.

In the Autumn of 1885, cholera, in a very severe form, made its appearance in many of the Mediterannean Ports, and as constant and almost daily intercourse takes place between Cardiff and these ports, much alarm and anxiety naturally prevailed that the disease might be introduced into the Kingdom here. I therefore suggested that the consent of the Marquis of Bute, owner of the Flat

Holmes, should be obtained to establish there a depôt for the reception of cases that might arrive on board infected vessels, and, this having been obtained, tents were sent there to form a temporsry hospital for the reception of cases of cholera if such should be necessary.

An application was made to the Customs' Authorities that a quarantine boat should be placed on the Station for the purpose of visiting all vessels arriving from infected ports, as had been done in 1866. Objection having been made on the part of the Treasury to bear the costs of this, a deputation, consisting of the Mayor, Town Clerk, and myself, proceeded to London, and having been joined by Sir E. J. Reed, the Member for the Borough, we had an interview with Mr. Balfour, the President of the Local Government Board. It was urged that the object to be obtained was not simply for the protection of Cardiff, but really that of the Kingdom; as, if cholera were introduced at all it would probably be either here or at Liverpool, and, therefore, the charge should be borne not by Cardiff but out of the National Exchequer; this view was accepted by the President.

An order was immediately issued placing a quarantine boat on the station, and all vessels arriving in the roads from infected ports were required to bring to and hoist the yellow flag. On this signal being made, an officer on board this quarantine boat was requested to visit the ship and put the quarantine questions contained in a printed form to the Captain or Master. Receiving his answers, the Captain was required to sign the same acknowledging their accuracy. The officer had then to inspect the ship to ascertain whether the crew were all healthy, if so, he then gave instructions that if any drinking-water had been supplied while in an infected port this was to be discharged, as also any bilge or ballast-water on board; complying with these instructions the vessel was allowed into port.

Should the officer on visiting any vessel, on board which cases of sickness had occurred while in an infected port, or on the passage hither, or if from any other circumstance the vessel was deemed to be infected, he had power to detain the vessel in the roads for 12 hours, and place himself in communication with your medical officer, whose duty it was to proceed, without delay, and certainly within the prescribed time, to visit the ship and deal with it as the circumstance of the case required. If, in his opinion, it was infected he had power to direct such vessel to proceed to the mooring-station (this station having been previously approved by the proper authorities, and was within one mile S.E. of the Flat Holmes) there to be dealt with as necessary.

Several vessels were sent there; of these, four were found to have suffered more or less from the disease. One, an Italian mail

steamer arriving here from Genoa, the "Abyssinia," had two of the crew suffering from cholera at the time of my visit. I caused them to be immediately removed to the temporary hospital on the Flat Holmes, and placed them under treatment; one of them was fatal, and the other recovered. Within a few hours after the removal of these two, another was seized with cholera. He was also conveyed to the hospital, and after passing through a very severe attack he also recovered. The "Abyssinia" was visited twice daily and disinfected on each occasion. Every compartment, especially the cabins previously occupied by the sick, were exposed to the action of chlorine or sulphurous acid gases; all cloths that had been in contact with the sick were destroyed. At the end of seven days the whole of the crew were carefully examined and being found healthy the vessel was admitted into port. While here it was kept under daily supervision; the crew continued healthy until the vessel left. Some weeks afterwards, on the "Abyssinia" again arriving here, I visited it and found the same satisfactory condition continued on its previous outward passage.

The other vessel was the S.S. "Rishangleys," from Marseilles. When visiting this ship the captain was found to be suffering from cholera symptoms. He was removed to the hospital and recovered. The "Rishangleys" was dealt with in the same manner as the "Abyssinia" with equal success.

Had the cholera reached Cardiff, I was prepared to recommend your Board to erect tents at a convenient spot, and there remove all the healthy from infected houses, who should remain there for a probationary time, as was done with such marked success in 1854.

In 1886 cholera prevailed with great intensity in many of the Spanish ports; the same action was taken here to protect this port as in 1885.

There was one noteworthy matter that came under observation on this occasion still further confirming the fact that the disease was dangerously communicable by water.

The S.S. "Crindau" arrived here from Barcelona. On arriving in the roads the captain gave satisfactory answers to the whole of the questions and signed them as correct. As the vessel had taken water on board while at Barcelona he was directed to discharge this, as also the bilge and ballast-water, and, on compliance, was told he might enter the port. When the vessel entered, the crew, as is customary, were discharged; two or three fresh hands were taken on board. In the middle of the night I received a letter from Mr. Lean, a medical gentleman residing at the docks, stating that he had been called to a case of cholera on board the "Crindau" that proved fatal in five hours. I immediately visited the ship and ascertained this to be the case. I ordered the vessel to be removed without delay to the mooring-station near the Flat Holmes; as the tide was going out this was done.

On enquiring into the circumstance of the case I learned the following fact: One of the new hands, who had joined the ship in the afternoon in perfect health, was required to assist in removing it from one part of the docks to another. The afternoon was very sultry and muggy. He was very thirsty, and helped himself to some water contained in a barrel on deck. He drank freely of it and was very shortly seized with cholera. Mr. Lean, and another medical gentleman who had come on board, examined the water, and, to use their words, both gentlemen state "it stank abominably." To prevent any mischief, Mr. Lean ordered the barrel to be started with a marling-spike and so emptied it. I ascertained from one of the crew that none of the others had drank from this barrel, hence the explanation of the nature of attack. The vessel was detained at the mooring-station and dealt with in the usual manner. No fresh case having occurred, and the vessel being disinfected, she was allowed to re-enter port. I also found that while at Barcelona some of the crew had suffered from choleraic diarrhœa.

I urged the Authorities to take proceedings against the master of the vessel for giving false replies to the questions and non-compliance with the directions given to discharge the water, but as the owners had been put to considerable expense in removing the vessel and its detention at the mooring-station, and there being no further extension of the disease, this course was not taken.

For obvious reasons this was a mistake, and I should strongly urge your Board, should such an offence be repeated, in no case to omit proceeding according to the law applicable in such a case.

Drainage System.

On the formation of the Local Board of Health, action was taken to construct a system of drainage, and the most eminent engineers in this department were consulted. The scheme that first met favor was that of Mr. Rammell's, known as the "pipe system," but after much consideration this was abandoned and the "brick" or "barrel system," recommended by Mr. (now Sir John) Hawkshaw, adopted. The hesitation in selection caused some delay, but, when decided, the work was pushed forward with much energy, and in 1855 the first section was completed.

Concurrently, a private company had been established to provide a good water-supply, and in 1856 this also became available. From these two years may be dated the commencement of those important sanitary operations which have resulted in that great improvement that has annually taken place in the sanitary condition of Cardiff.

It will now be my object to point out the degree to which these and other works of sanitation have severally contributed to this change, also the supervision and care necessary to be exercised over them to maintain their efficiency.

When the first section of the new system of sewers became available, the great improvement in the health of the inhabitants consequent thereon induced the Local Board actively to carry out all extensions necessary to meet the requirements of the then existing town, and also to provide for the rapid growth that yearly takes place. The magnitude and importance of these works can only be recognized by the facts that an annual expenditure of many thousands of pounds has been incurred, and that the lineal length of the main sewers exceeds 45 miles. As each portion of the sewers were completed, house connection has been enforced and, practically, no cesspits exist.

Great as have been the advantages that have accrued from these operations, disturbing causes have lately arisen that militate against their complete efficiency, and these at times produced much sickness in certain localities in this district. To understand them it will be necessary I should describe the principles on which your system of sewers have been constructed. At the commencement, in devising a plan, great engineering difficulties had to be overcome, due to the configuration of the district. The greatest portion of the town is built on an almost complete flat; the remainder has a gradual rise to the north, but at no point is it higher than 65 feet above the sea level, the inclination being from north to south. In this direction the mains, as far as practicable, are carried out They consist of brick culverts, some of them of a subovate others of a circular form, sufficiently deep and large enough to admit those in charge having access and passage through them when it is necessary to make an examination. They vary in size from 3 × 2 feet to 4 × 3-6 feet, and are laid at gradients of one foot in 127 to 1 foot in 1,700. As the enlargement of the town has followed an easterly and westerly direction, and chiefly confined to the part described as a flat, the lower gradients constitute by far the majority.

To carry away their contents, sufficient means of flushing are absolutely necessary, and to this means I desire to call your attention. The flushing of your sewers is chiefly effected by storm-water, supplemented at the extreme end of the Bute Docks by tidal water, a moat near the Castle grounds, and a trifling rivulet passing in front of the old Militia Stores into the sewer at Maindy, the latter always more or less dry during the summer weather. With the exception of these, the flushing is effected by water obtained from the public supply, namely, the reservoir in Loudon Square, and, until lately, only one tank near Castle Road. For many years the means of flushing were adequate, the average rainfall being 43 inches per annum.

Water Supply.

The public water-supply was obtained from the gathering-grounds at Lisvane, received into a reservoir at Llanishen (the capacity of this being 80 million gallons) from which eight hundred thousand to one million gallons of water were discharged through the main conduits to be distributed throughout the town.

For some years the daily supply was much in excess of what was considered necessary, namely, 25 gallons per head per inhabitants, or 9 gallons for domestic and 16 for municipal and trade purposes; but as the town grew this proportionate quantity sensibly and rapidly decreased until the number of gallons per head fell to 16, and I called the attention of your Board to this fact.

To meet the increasing difficulty the pumping station at Ely was constructed, and, for a time, half-a-million gallons per diem was obtained, and again in 1887 this source of supply was increased to 750,000, and in 1884 to about a million; but so enormous was the increase of the town that even with this increase the daily supply in 1886 gave only 14 gallons per head.

In 1885, Parliamentary powers were obtained for a new source of supply, namely, from the Taff Vawr water-shed of the Brecon Beacons, to which I shall presently allude, but this is not yet available, although the necessary constructions have been carried on with much activity.

Within the last two years an additional reservoir, with a storage capacity of 300 million gallons, has been constructed at Llanishen, but as the water at present received into this is simply the overflow from the old reservoir, its contents only reach 220 million gallons. This became available in November, 1886, but owing to the great drought that commenced in January of the present year the daily supply was only 14 gallons per head from all sources, and in June it fell to 13. The storm-water during the months of July, August and September was little more than nil.

From 1884 to 1886 complaints were constantly made to me of the offensive exhalations from the ventilating shafts in centre of streets and the gully grids in gutters near the pavements. These complaints were more frequent in the streets where the gradients are exceptionally low, and in these localities where the exhalations occurred, diarrhœl diseases were very prevalent and fatal during the summer months, and at times typhoid fever. To meet these evils I had frequent occasion to seek the assistance of Mr. Harpur, your Surveyor, and he at all times immediately and successfully afforded me this assistance. Where offensive ventilating shafts could be temporally closed this was done. The old gully grids known as the "Gloster" were abolished, they having been found defective, as follows:—

The old gully grids known as "Gloster grids" are formed by first building a brick pit, from the bottom of which the drain leads to the sewer. In this pit an ablong galvanized rivetted bucket is suspended from a cast-iron dipper by a wrought-iron pin, which passes through holes corresponding with each other near the centre of the dipper and under the rim of the bucket, and by this means the trap is formed.

To clean out the Gloster grids the grating is first removed; the dipper and bucket are then lifted out of the pit, the bucket emptied of its contents, the water running into the gully pit and the solid matter left in a heap to be removed by the scavengers.

The buckets frequently became defective and the water leaked out; in other cases the pins for suspending the buckets were lost, and as a consequence the buckets were thrown into the bottom of the gully pits, and from these causes they became useless as "traps" and were transferred into open sewer ventilators immediately adjoining the public footpaths, and in many cases in close proximity to the doors and windows of dwelling houses.

Evans's patent cast-iron gully grids, manufactured at the Eagle Foundry, Llandaff, were substituted.

These gully grids are cast in one piece, with the exception of the top grating and cover, which are hinged to the gully box by means of a stout wrought-iron bolt.

Each gully box is divided into two compartments, the largest being for the purpose of the water-trap which is formed by two cast-iron plates across the gully box about three inches apart, the one attached to the bottom of the grid and extending about three-fourths of the height of the grid, thus making a water-tight compartment and the other suspending from top of the grid for about half the distance downwards, and the cross plates over-lapping in this manner form a trap which cannot possibly get out of order.

The other compartment is provided with a solid cast-iron cover, which is locked down and cannot be opened except by the men in charge. At the bottom of this compartment there is a six-inch diameter hole with spicket underneath for insertion into the socket of the drain pipe, and when any drain becomes choked, by unlocking and opening the cover of this compartment the drain rods can be passed into the sewer without disturbing the gully grid or interfering with the road surface.

This gully grid is to all intents and purposes a perfect street stench trap if only kept supplied with water in dry weather, and takes up but little space, its size being 24 inches, 12 by 12.

Automatic flushing tanks have been recently constructed in various parts of the district, especially in streets where blind ends exist. Subjoined is a list:—

No. of Tanks	Where Situated	Contents in Gallons	How supplied.
1	Moy Road at Western end - -	2,100	Waterworks
1	Oakfield Street, ditto - - -	2,100	,,
1	Albany Road, South of Roath Church -	2,100	,,
1	Treharris St. at junction with Plasnewydd Rd.	1,000	,,
1	Ruthven Street at Western end - -	1,040	,,
1	Broadway, ditto - - - -	2,100	,,
1	Pearl Street at Northern end - -	765	,,
1	Splott Road at North-West end - -	854	,,
1	Seymour Street at South-East end - -	1,147	,,
1	Claude Street at Southern eud - -	1,040	,,
1	Newport Road, North-East of Wordsworth St.	1,800	,,
1	Daisy Street at Western end - -	875	,,
1	Craddock Street, ditto - - -	2,450	,,
1	Radnor Street at Northern end - -	2,100	,,
1	Denton Road, ditto - - -	900	,,
1	Mortimer Rd. at North-West end Cathedral Rd.	2,100	,,
1	Plasturton Street at South-East of Sneyd Street	1,950	,,
1	Ryder Street ditto Plasturton Place	2,100	,,
1	Ryder Street, ditto end of Talbot Street	2,100	,,

As a further precaution during the hot and dry months of last summer, Mr. Woosey was instructed to throw down the gully grids and ventilating shafts where noxious exhalations might be expected to occur (by means of a water-cart), a quantity of water containing concentrated solutions of iron salts, and this was done with persistent regularity.

The effect of these conjoint sanitary operations eventuated in an almost total absence of offensive exhalations from your sewers, and a greatly reduced mortality due to zymotic diseases.

The condition of house sewerage is also a matter of little less moment than that of the public sewers. I have on many occasions directed your attention to the serious consequences that have resulted from the defective sewer arrangement of houses. I have required your Sanitary Inspectors to devote a considerable portion of their labours to discover where such defects may be found to exist. The result of their enquiries during the years 1885 and 1886 have already been tabulated in my Reports for these years; subjoined is a return for the present year :—

Table F. HOUSE INSPECTION.

CARDIFF DISTRICT.

Name of Street	Number of Houses Inspected.	Defective Drains.	Choked Drains.	W. C. Pans and Syphons Defective	Defective Stench Traps permitting an escape of sewer gas.	Scullery Sinks connected with Drains.	Inside Closets not Ventilated.	Closets not supplied with Water.	Other Nuisances.
Pendoylan Street	21	...	...	1	...	...	...	21	5
Herbert ,,	31	1	...	2	4	1	1	31	4
Ellen ,,	35	...	...	1	...	...	...	35	8
Thomas ,,	31	1	...	2	1	...	...	31	7
South William ,,	8	...	...	...	1	...	...	8	...
Evelyn ,,	35	...	...	4	4	...	...	35	1
Adelaide ,,	27	...	...	...	...	...	...	27	...
North William ,,	36	1	...	1	2	...	...	36	3
Adam ,,	41	...	1	11	6	3	...	41	7
Stanley ,,	31	...	...	1	1	...	...	31	8
Love Lane ...	48	...	...	1	1	...	...	48	9
Mary Ann Street	53	...	...	...	1	...	...	53	5
North William ,,	34	...	3	3	...	...	...	34	7
Thomas ,,	31	1	2	2	1	...	...	31	8
Tyndall ,,	51	2	1	4	2	3	...	46	19
Mary Ann ,,	53	...	...	1	2	...	...	53	10
Tredegar ,,	54	2	2	8	5	7	...	54	5
Duffryn ,,	23	...	...	1	1	...	...	23	6
Pendoylan ,,	30	1	...	2	...	...	...	30	...
Thomas ,,	31	...	...	2	2	...	...	31	1
Herbert ,,	32	...	...	...	5	...	...	32	5
Cairns ,,	12	2	...	...	...	...	...	12	1
Ruperra ,,	17	...	...	...	...	...	...	17	2
Rodney ,,	17	...	...	1	...	3	...	17	...
Stanley ,,	31	...	...	1	...	...	...	31	1
Davis ,,	26	...	...	5	1	11	...	26	4
Garth Court ..	7	...	...	...	...	...	...	7	1
Merthyr Lane ...	27	1	...	...	...	...	...	27	5
TOTAL ...	879	12	9	54	40	28	1	875	132

HOUSE INSPECTION. Table G.

CANTON DISTRICT.

Name of Street	Number of Houses Inspected.	Defective Drains.	Choked Drains.	W. C. Pans and Syphons Defective.	Defective Stench Traps permitting an escape of sewer gas.	Scullery Sinks connected with Drains.	Inside Closets not ventilated.	Closets not supplied with water.	Other Nuisances.
Daisy Street ...	40	...	8	...	.	...	...	40	8
Gladstone Crescent	21	4	...	2	...	3	...	21	2
Quay Street ...	17	...	...	...	3	2	1	14	4
Wyndham Road...	62	...	1	...	1	2	...	50	5
Harrowby Street ...	47	2	1	3	3	...	...	47	15
Canton Barracks ...	6	...	1	...	1	...	...	6	3
Union Street ...	56	1	2	2	2	...	...	56	10
Tressilian Terrace...	37	...	...	...	5	...	...	30	2
De Spencer Street	15	...	1	...	...	...	...	15	10
Halket ,,	52	2	1	9	1	...	...	52	10
Lewis Court ...	9	...	2	1	2	...	...	9	2
Llandore Court ...	20	...	...	2	...	...	..	20	3
Union Buildings ...	21	...	2	2	...	...	...	14	8
Davies' Place ...	5	...	...	...	...	...	...	...	3
Pontcanna Place...	22	...	1	2	3	...	...	22	3
Carpenters Arms Ct	7	...	1	..	...	...	...	5	...
Davies' Crescent ...	10	...	...	...	...	8	3	10	2
Eldon Square ...	16	3	4	...	...	...	...	16	6
Springfield Place...	39	1	4	1	...	...	...	39	8
TOTAL ...	502	13	29	24	21	15	4	466	104

HOUSE INSPECTION. Table H.

ROATH DISTRICT.

Name of Street.	Number of Houses Inspected.	Defective Drains.	Choked Drains.	W. C. Pans and Syphons Defective.	Defective Stench Traps permitting an escape of sewer gas.	Scullery Sinks connected with Drains.	Inside Closets not ventilated.	Closets not supplied with Water.	Other Nuisances.
Milton Street ...	62	3	2	3	5	...	...	62	9
Helen „ ...	79	...	1	3	...	...	...	79	19
John „ ...	61	...	2	1	1	...	...	61	18
Cycle „ ...	29	...	...	...	5	...	...	29	3
Janet „ ...	22	...	...	...	...	...	...	22	3
Charles „ ...	25	...	2	...	...	...	...	25	7
Walker Road ...	24	...	...	...	...	...	...	24	4
Daniel Street ...	27	...	...	...	1	...	...	27	4
Agate „ ...	16	...	...	...	2	...	...	16	3
Cecil „ ...	42	...	...	...	1	...	...	42	5
Shakespeare Street	34	...	1	...	...	...	...	34	8
Railway Street ...	124	2	3	...	2	...	...	124	15
Pearl „ ...	118	...	5	6	...	...	...	118	11
Blanch „ ...	29	...	1	...	2	...	...	29	5
Bertram „ ...	60	2	3	...	5	...	...	60	8
Arabella „ ...	40	...	3	...	...	...	...	40	5
Arthur „ ...	24	...	2	1	...	...	...	24	5
Robert „ ...	8	...	...	...	2	...	...	8	3
Rose „ ...	29	2	...	1	3	...	...	29	8
Adeline „ ...	99	1	2	...	6	...	...	99	11
TOTAL ...	862	10	30	15	35	...	...	862	155

But by far the most frequent and serious evil connected with defective sewer arrangements of house drainage is to be found in latrines attached to a very considerable proportion of the houses in this district, such being especially occupied by mechanics, skilled artisans, and labourers. These probably reach three-fourth of the total.

The latrines are constructed on the pan and syphon system. This system is simple and would be found satisfactory and efficient if the pans were kept clean and the syphon-traps free from obstruction; but to maintain their efficiency it necessitates constant care and some amount of trouble, it being necessary that every time the latrine is used sufficient quantity of water should be thrown down. The reports of your Inspectors shew that this precaution is rarely taken, forming the exception and not the rule; hence, the pans are constantly found to be in a filthy condition and the syphons blocked up.

When the new supply of water from the Taff Vawr can be utilized there can be no difficulty in overcoming this evil, as each latrine might then be required to have a small cistern containing a cubic capacity of $2\frac{1}{2}$ gallons of water, with a ball-cock arrangement and a valve at the bottom to permit the flow of eject water into the pan, this valve being put into operation by means of a small chain hanging down from the cistern; this being supplied on the constant system it is always full and entails no labour to ensure a proper amount of flushing and keeping the pan clean and syphon free from obstruction.

The new water-supply being inexhaustible, it would be to your interest, as a sanitary provision, that the expenditure of water on the part of occupiers of houses should be encouraged rather than, as at present, repressed, as this expenditure would then materially increase the flushing of your main sewers.

It may here be interesting to detail the important works now being constructed by your Water Engineer, Mr. J. A. B. Williams, in connection with your Taff Vawr supply.

Taff Fawr Works.

A reservoir (No. 2) called Cantreff Reservoir is now being constructed at Taff Fawr, with a capacity of 312 million gallons, and the line of pipes from there to Cardiff are near completion.

The total storage capacity when the above reservoir is made will therefore be about 700 million gallons.

As soon as the water from the Taff Fawr River is brought to Cardiff, it will be necessary to discharge for compensation to Mill-Owners 331 cubic feet per minute or 3 million gallons per day into the River Taff.

When the above reservoirs are found to be insufficient for the needs of the town, you have Parliamentry powers for the construction of Nos. 1 and 3 reservoirs, with a storage capacity respectively 230 million gallons (No. 1), and 700 million gallons (No. 3); but on these works being brought into use a further amount of compensation water will have to be discharged into the river of 530 cubic feet per minute, or $4\frac{3}{4}$ million gallons per day. Total compensation, $7\frac{3}{4}$ million gallons daily.

The probable amount of water available for the supply of the town on the completion of the works now being carried out will amount to 5 million gallons per day, and on the completion of the whole scheme (as sanctioned by Parliament) 8 million gallons per day exclusive of compensation.

The mains now laid down from Taff Fawr to Cardiff will be sufficient to bring down the whole of the 8 million gallons per day.

Area of gathering grounds for No. 2 reservoir (Cantreff), 4,000 acres; ditto for No. 3 reservoir, 6,400 acres.

Drought of 1887.

The drought of 1887 may be said to have commenced in February and only ended with October. Since accurate rain gaugings have been taken there has been no year so dry. 1864 approached it, but was not to be compared with the summer of 1887, all things considered.

The restrictions on the supply were commenced on the 8th of August and discontinued on the 4th November. During the first fortnight the water was cut off for four hours per day. From then until the 30th of September it was turned off at 5.30 p.m. and on again till 4.30 a.m. From 30th September until 4th November it was shut off till 5.30 a.m. The average consumption before the water was turned off was at the rate of nearly 22 gallons per head on a population of 135,000 (including Penarth). After turning the water off during the night the consumption fell to about 13 gallons per head per day. Since the restrictions have been taken off the consumption has averaged about 18 gallons per head.

The following are the analyses shewing the relative purity of the water obtained from each source of supply and two hypothetical analyses, the one shewing the limit of impurity, beyond which it would be dangerous to be used for drinking purposes, the other a standard of purity.

Table I.

Description	Total Solid Matter	Albuminoid Ammonia	Free Ammonia	Nitrogen as Nitrates & Nitrites	Total Nitrogen found	Previous Sewage or Animal Contamination	Chlorine	Magnesia Salts	Hardness		
									Temporary	Permanent	Total
Water from Ely	31·2	·006	...	·059	·064	slight	1·50		18·8	30.8	44·6
„ „ Llanishen	22·8	·0085	·0026	·047	·056	...	1·15		9·0	9·4	18.4
„ „ Taff Vawr... ...	6·4	·0055	·003	...	·008	...	·75		...	4·3	4·4
Limit of Impurity Standard ...	40·0	·015	·010	·100		700	3·0		5·0	24·0	29·0
Standard of Purity	20·0	·004	·002	·050		nil	1·5		14·0	3·0	17·0

Having now enumerated the sanitary operations commenced in 1852, and carried on to the present time. I may here summarise their total costs to 31st March, 1887.

	£	s.	d.
To Sewerage Works	131,690	8	1
To Special Improvements, such as the construction of streets and roadways; the repair of old streets, the purchase of houses and land where the streets have been too narrow, the houses unfit for human habitation, &c., &c. ...	226,362	19	7
Total ...	£358,053	7	8

This expenditure does not include the sum of £638,386 4s. 5d. already expended to provide a water supply, as this outlay is itself a source of income derived from the receipts obtained from the consumers.

Great as has been the expenditure, equally vast and important have been the results effected by it, whether estimated from the standpoints of the humanitarian or the economist; the former would consider the numerical figures representing the lives saved, the latter by estimating the value of the lives so saved. The first can easily be arrived at by taking the mean of annual death-rate for the two decades ending 1846 and 1856. During the former the death-rate was 30 per 1,000 inhabitants, in the latter it had increased to 33 per 1,000; the mean of the 20 years would be 31·5. As regards the latter decade, the increased death-rate was due to two disturbing causes of an unusual character, namely, two severe epidemics introduced from other countries, therefore not indigenous to this country, it may therefore be more accurate to take the mean death-rate of the whole 20 years, namely 31·5 as the ordinary annual death-rate of the district at that time.

In 1856 the two important sanitary operations to which I have already alluded to, namely, the first sections of the sewers and the new water supply, became available, and resulted in a diminished annual death-rate, observed in the decade ending 1866, when the mean death-rate fell to 25·7, or an annual saving equal to 6 per 1000. This most important saving of life was not due to temporary influences, but was maintained progressively during the two succeeding decades 1876 and 1886, as will be seen by the subjoined table, shewing the mean of annual deaths, the death-rates, and the mean annual saving of life in each decade; the total saving in the 30 years being 15,480.

Table K.

Years	Mean Population	Deaths	Mean Death Rate	Mean Annual Saving	Saving of life in 10 years
1856	19,579	6,599	31·0	...	...
1866	31,807	8,199	25·7	186	1,860
1876	45,618	10,313	22·6	405	4,050
1886	87,213	18,092	20·7	957	9,570
		TOTAL	...	1,548	15,480
1887	104,580	2,280	21·8	1,040	1,040

The magnitude of the saving of life effected by the sanitary operations carried out in Cardiff attracted the attention of Mr. John Simon, C.B., Medical Officer to the Privy Council, who, in his official capacity, in 1866 made a report to that authority, and through it to Parliament, containing the most satisfactory comments as regards your Board and especially gratifying to myself. These remarks are contained in the re-publication during the year 1887 of Mr. Simon's valuable reports, and will be found at page 266, volume ii., and were as follows:—

"Foremost, I must name Cardiff. Of the monstrous mortality which that town suffered before its sanitary works were constructed, nearly a third part has now ceased. The death-rate by typhoid fever has fallen down from $17\frac{1}{2}$ to $10\frac{1}{2}$, and that by diarrhœa from $17\frac{1}{4}$ to $4\frac{1}{2}$. The death-rate by cholera in 1848-9 was 208; in 1854 it was 66; in 1866 it was $15\frac{1}{2}$. The results obtained in Cardiff are the more creditable to those who have wrought them, as the difficulties to be conquered were specially great. The authorities of the place have done a great public service and set an admirable example, not least in their choice of a medical officer and their confidence in him whom they have appointed. I can have few happier duties in my office than that which I now fulfil in referring to the terms in which Dr. Paine is spoken of by Dr. Buchanan, as formerly (in my seventh report) by Dr. Hunter, and in expressing my belief that Cardiff and England are also indebted to his zeal and efficiency for the saving of many hundreds of lives."

From the standpoint of the economist to determine the money value of a life saved to the productive industry of the country is a more difficult problem to solve. Factors represented by unknown numbers have to be considered. The resources of the country, whether in money or kind, have to be computed, and the extent to which these are due to the physical or mental labours of the population.

Land uncultivated or untilled, machinery unconstructed or immoveable, commerce and trade paralysed, the mental labours of the scientist, the mathematician, and the philosopher (whose energies co-ordinate and direct these) dormant, would represent a yearly loss of many millions to the resources of the Kingdom. Practically, the entire yield of the country is represented by these sources, less the profits afforded by its accumulated wealth. Having estimated

these severally and arrived at the full value thus resulting in each year, this amount would have to be divided by the mean of population, the quotient would represent the individual earnings of the population were labour equally distributed.

Assuming the mean of individual longevity in this Kingdom to be 35 years, this mean has to be divided into two sections; below the age of 15 years—all of this period of life not only do not contribute to but entirely abstract from the resources of the Kingdom, but by the labour of the remaining 20 years are these resources afforded. The unit represented by a saving of life contributes its part to the results of the labour period. and the mean of labour profits is due to that unit of contribution, and has to be considered as its money value, as it really serves to fill the void occasioned by death or the migration of those who are attracted to our distant colonies or other countries where the labour fields afford the probability of obtaining a more lucrative return for their individual exertions. It may be urged that the limited area of this country by reason of an excess of population would reduce the value earned by each individual. The time may arrive when such may be the case, but it is not so now.

I may instance this by the following facts. The estimated population of the Kingdom in the year 1885-86 was 36,331,119; that of the year 1886-87, 36,709,447, shewing an increase of population of 378,358. The increase of the productive resources of the Kingdom in 1885-86 £89,683,783, in 1886-87 £91,052,948, an increase of £1,369,165.

Mr. Farr, the eminent statistician, who carefully considered the matter in all its bearings, and who is the greatest authority on this subject, states, the money value of a life saved to the productive industry of the country, if a male £300, if a female £150. Assuming that the number of lives saved of each sex to be equal, you have to multiply the total lives saved in this district in the 30 years ending 1886 (as seen in table J), 15,480 by 225, the resultant shewn will indicate a money value equal to £3,483,000.

I now pass on to matters more particularly relating to the incidents of 1887. First the meteorological observations of this year and the degree to which these effect the health and mortality of the Kingdom.

JANUARY. The month of January was cold, dull, and foggy, until the end of the third week, with frequent falls of snow and a minimum amount of rain, the prevailing winds being more or less N. and N.E.; after this the winds changed to the S. and S.W. with brighter days and warmer weather, but the mean temperature of the month was 3°, less than that of the mean of the corresponding months during the preceeding five years. The Barometer some-

what unsteady; the highest reading was 30·672 inches on the 21st, the lowest 28·868 inches on the 6th, the mean of month being 29·969 inches. The highest temperature registered in the shade was 52°·0 on the 19th, the lowest 22°·2 on the 2nd; the mean of maximum being 42°·2, the mean of minimum 32°·9, the mean of month 37°·5; the temperature was at or below 32° on 16 days; the mean reading of hygrometric dry bulb was 36°·6, of wet bulb 35°·9; there were 15 days on which 0·01 inch or more rain fell, the greatest fall in 24 hours was on the 7th, when it measured 0·73 inch; the total rainfall of month was 2·76 inches. The total deaths from all causes registered during the four weeks ending January 29th were 217, giving a death-rate on Registrar-General's lesser estimate 27·8; the deaths from the seven chief zymotic diseases 20, giving a death-rate 2·9.

FEBRUARY was cold and dry, the mean of the month being 1·8 below the average; the weather, that had become warmer during the last week of January, changed at the commencement of this month, and continued very cold until the 24th, the prevailing winds being E. and N.E. There were occasional showers during the first few days, but after the 5th the weather was dry until the end of the third week, S.W. winds then set in, continuing from that direction till the end of the month, with some rain; the barometer was high and steady, the highest on the 7th, 30·696 in., the lowest 29·736 in., the mean of month 30·304 in.; the highest temperature was 53°·0 on the 24th, the lowest 24°·6 on the 17th, the mean of maximum 45°·0, the mean of month 40°·1; there were ten days when the temperature was at or below 32°; the mean of hygrometric dry bulb 38°·5, of wet bulb 37°·7; there were only six days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was 0·63 in. on the 3rd, the total rainfall being 1·45 in. The total deaths registered in the four weeks ending February 26th were 170 giving a death-rate of 22·1; the deaths from the seven chief zymotic diseases were 13, with a death-rate of 3·1

MARCH was very cold, being 3°·4 below the average; E. winds prevailed until the 22nd when W. winds set in with warmer weather, some rain continuing until end of month; on the 14th and 15th there was a heavy snowstorm, exceeding 12 in. in depth, and on the 20th snow again fell; on the 24th there was a strong gale from the west; the barometer continued high and steady, its highest reading 30·644 in. on the 2nd, its lowest 29·290 in. on the 23rd, the mean of month 30·072 in.; the maximum temperature was 58°·3 on the 29th, the minimum 20°·4 on the 16th, the mean of maximum 45°·2, of minimum 33°·1, the mean of month 39°·1; the temperature was at or below 32° on 15 days; the mean of hygrometric dry bulb 38°·0, of wet bulb 36° 0; there were ten days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was

1·16 in. on the 15th, the total rainfall for month was 3·21 in. The total deaths registered during the five weeks ending April 2nd were 259, the death-rate being 25·7; the deaths from the seven chief zymotic diseases 26, the rate 2·5.

Month	Cardiff	Greenwich	Above	Below
January	37°·5	35°·6	1°·9	...
February	40°·1	38°·8	1°·3	...
March	39°·1	37°·6	1°·8	...
Mean of Quarter	38°·9	37°·3	1°·6	...

April was also very cold and dry, the temperature being 2°·5 below the average; strong E. winds prevailed until the 18th, W. winds then set in and continued till the end of the month. On the 6th there was a heavy fall of snow followed by strong gales from the N.E., these lasting four days, after this the weather was dry until the 21st, from which date there where frequent showers until the end of month; the barometer was high and steady, its highest reading 30·630 in. on the 17th, its lowest 29·300 in. on the on the 23rd, the mean of month 30·005 in.; the maximum temperature was 61°·4 on the 12th, the minimum 29°·9 on the 15th, the mean of maximum 52°·6, the mean of minimum 36°·6, the mean of month 44°·6; the temperature was at or below 32° on two days; the mean of hygrometric dry bulb 48°·8, of wet bulb 41°·9; there were ten days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was 0·45 in. in the 26th, the total rainfall was 1·63 in. The total deaths registered in the four weeks ending April 30th, were 233, with a death-rate of 26·4; the deaths from the seven chief zymotic diseases 36, with a rate of 4·4.

May.—The cold and dry weather continued throughout this month, the temperature 1°·2 below the average; the winds were variable, but E., N.E., and N.W. were in excess. On the 20th, 21st and 22nd the weather was stormy with frequent gales from the N.W., and on the 21st there was a heavy hailstorm. On the 27th there was much thunder; the barometer continued high and steady, its highest reading was 30·390 in. on the 8th, its lowest 29·350 in. on the 20th, the mean of month 30·033 in.; the maximum temperature 66°·3 was registered on the 31st, the minimum 37°·4 on the 21st, the mean of maximum 57°·5, the mean of minimum 44°·3, the mean of month 50°·9; the mean of hygrometric dry bulb was 50°·9, of wet bulb 48°·1; there were 11 days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was 0·63 in. on the 19th, the total rainfall for month was 1·94 in. The total deaths during the four weeks ending May 28th were 183, death-rate 22·7; the seven chief zymotic diseases were 20, death-rate 2·4.

June was a very hot, fine, and dry month, the temperature being 3°·0 above the average; it was the driest month of the year, the

total rainfall measuring only 0·60 in. The hot weather set in on the 5th, when the maximum registered 67°·0, and continued hot till the end of the month; the highest temperature 84°·0 was reached on the 17th, there were two other days when it exceeded 80°·0, two when it exceeded 79°·0, and eight when it ranged from 70° to 80°. Although the weather was hot during the day, the nights were cool, with refreshing breezes, the difference between the maximum and minimum temperatures registered ranging on many occasions from 20° to 26°. The winds were very variable until the 16th, after that date, with the exception of one day, namely, the 27th, they were E. The barometer continued high and steady, its highest reading was 30·400 in. on the 29th and 30th, its lowest 29·720 in. on the 3rd, the mean of month 30·185 in.; the maximum temperature registered on the 17th was 84°·0, the minimum 45°·4 on the 1st, the mean of maximum 70°·0, the mean of minimum 52°·1, the mean of month 61°·0; the mean of hygrometric dry bulb was 62°·2, of wet bulb 58°·3; there were four days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was on the 2nd being 0·51 in., total rainfall for month was 0·60 in. The total deaths during the five weeks ending July 2nd were 188, death-rate, 18·7; the deaths from the seven chief zymotic diseases were 21, death-rate 2·0.

The monthly mean temperature at Cardiff during the quarter as compared with Greenwich was as under:—

Month	Cardiff	Greenwich	Above	Below
April	44°·6	44°·1	0°·5	...
May	50°·9	49°·8	1°·1	...
June	61°·0	60°·9	0°·1	...
Mean of Quarter	52°·2	51°·6	0°·6	...

JULY.—Hot and dry weather ruled the month of July, the temperature being 3°·8 above the average; the days were fine and bright until the 10th, they were then dull, close, and cloudy, with occasional sunshine; the winds were very variable but S. and S.W. were slightly in excess. There was a considerable amount of thunder on the 17th and a storm of heavy rain on the 27th; the barometer still continued high and steady, its highest reading was 30·330 in. on the 1st, the lowest 29·640 in. on the 27th, the mean of month 30·042; the maximum temperature registered on the 3rd was 84°·1, the minimum 46°·9 on the 18th, the mean of maximum 73°·8, the mean of minimum 55°·4, the mean of month 64°·6; the mean of hygrometric dry bulb 67°·3, of wet bulb 62°·2; there were 13 days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was on the 26th being 0·85 in., the total rainfall for month was 1·51 in. The total deaths during the four weeks ending July 30th were 141, death-rate 17·5; the deaths from the seven chief zymotic diseases 18, death-rate 2·1.

AUGUST was fine and dry, the temperature being about the average; the days were bright and sunny with occasional refreshing showers during the night, E. winds were somewhat in excess. There was a thunderstorm on the night of the 17th with heavy rain; the barometer continued high and steady, its highest reading was 30·360 in. on the 3rd, its lowest 29·480 in. on the 31st, the mean of month 29,991 in.; the maximum temperature registered on the 6th was 83°·2, the minimum 44°·2 on the 15th, the mean of maximum 68°·7, the mean of minimum 51°·8, the mean of month 60°·2; the mean of hygrometric dry bulb 62°·6, of wet 58°·5; there were 11 days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was 1·02 in. on the 16th, the total rainfall for month was 2·88 in. The deaths registered during the four weeks ending August 27th were 173, with a death-rate of 21·1; the deaths from the seven chief zymotic diseases 50, death-rate 6·1.

SEPTEMBER.—The weather in September was cold and unsettled, the temperature being 4°·2 below the average, the more prevalent winds were S.W. till the 17th, E. and N.E. till the 24th, then N.W. till the 28th, and N.E. the 29th and 30th; the weather was very unsettled till the 19th, then fine till the 26th, and afterwards became again unsettled; there was a heavy storm with much rain on the 2nd, on the 6th a stiffish gale, and on the 17th heavy rain at night. The barometer was high and steady, its highest reading was 30·480 in. on the 19th, its lowest 29·220 in. on the 2nd, the mean of month 29·937 in.; the maximum temperature registered on the 5th and 7th was 61°·0, the minimum 35°·6 on the 29th, the mean of maximum 55°·0, the mean of minimum 48°·5, the mean of month 51°·7; the mean of hygrometric dry bulb 55°·3, of wet bulb 54°·9; there were 17 days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was 1·24 in. on the 1st; the total rainfall for month was 4·07 in. The total deaths registered during the five weeks ending October 1st were 204, with a death-rate 20·2; the deaths from the seven chief zymotic diseases 41, death-rate 4·0.

The monthly mean of temperature at Cardiff during the quarter as compared with Greenwich was as under :—

Month	Cardiff	Greenwich	Above	Below
July	64°·6	66°·5	...	1°·8
August	60°·2	62°·5	...	2°·3
September	51°·7	54°·0	...	2°·3
Mean of Quarter	58°·8	61°·4	...	2°·2

OCTOBER was very cold, the temperature 6°·2 below the average. N.W. winds were greatly in excess; the weather was fine until the 11th, then cold winds with frequent showers set in, lasting till the 17th, after this it was fine till the 25th, when the weather again became unsettled and very stormy; the barometer was high and

steady, its highest reading was 30·570 in. on the 18th, the lowest 29·460 in. on the 30th, the mean of month 30·121 in., the maximum temperature registered on the 16th being 45°·3, the minimum 27°·0 on the 26th, the mean of maximum 46°·8, the mean of minimum 39°·6, the mean of month 43°·2; the mean of hygrometric dry bulb 46°·0, of wet bulb 46°·3; there were 13 days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was 1·14 in. on the 29th, the total rainfall for the month was 2·80 in. The total deaths registered during the four weeks ending October 29th were 169, with a death-rate 20·2; the deaths from the seven chief zymotic diseases 16, death-rate 1·9.

NOVEMBER was cold and wet, with frequent storms, the temperature 4°·7 below the average; the winds during the first week were S. and S.W., after this they changed, and E. and N.E. were more or less prevalent throughout the remainder of the month; the barometer was very unsteady, its highest reading was 30·350 in. on the 16th, its lowest 28·810 in. on the 3rd, the mean of month 29·705 in.; the maximum temperature registered was 51°·8 on the 5th, the minimum 24°·8 on the 17th, the mean of maximum 41°·3, the mean of minimum 37°·5, the mean of month 38°·2; it was at or below 32° on six days; the mean of hygrometric dry bulb was 41°·2, of wet bulb 41°·0, the atmosphere indicated almost complete saturation; there were 21 days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was on the 3rd, being 0·69 in., the total rainfall for month was, 3·48 in. The total deaths registered during the four weeks ending November 26th were 159, with a death-rate 19·7; the deaths from the seven chief zymotic diseases 7, death-rate 0·8.

DECEMBER was also a cold and wet month, cloudy and foggy. W. winds were prevalent, the temperature 1°·7 below the average; the barometer was high but somewhat oscillating, its highest reading was 30·460 in. on the 2nd, its lowest 29·400 in. on the 15th, the mean of month being 29·881 in.; the maximum temperature registered was 51°·3 on the 13th, the minimum 25°·0 on the 28th, the mean of maximum 42°·1, the mean of minimum 34°·4, the mean of month 38°·2; it was at or below 32° on 11 days; the mean of hygrometric dry bulb was 39°·9, of wet bulb 39°·6; there were 20 days on which 0·01 in. or more rain fell, the greatest fall in 24 hours was 0·75 in. on the 12th; the total rainfall for month was 3·46 in. The total deaths registered during the five weeks ending December 31st were 210, with a death-rate 20·8; the deaths from the seven chief zymotic diseases 13, death-rate 1·2.

Months	Cardiff	Greenwich	Above	Below
October	43°·2	45°·0	...	1°·8
November	39°·4	40°·8	...	1°·4
December	38°·2	38°·1	...	0°·1
Mean of Quarter	40°·3	41°·3	...	1°·0

RAINFALL. Table L.

The following table shows the monthly rainfall, the greatest fall in 24 hours, with date, and the number of days on which 0·01 in. or more rain fell :—

Month	Total Depth	Greatest fall in 24 hours	Date	Days on which 0·01 in. or more rain fell
	Inches	Inches		
January ...	2·76	0·73	7th	15
February ...	1·45	0·63	3rd	6
March ...	3·21	1·16	15th	10
April	1·63	0·45	26th	10
May	1·94	0·63	19th	14
June	0·60	0·51	2nd	4
July	1·51	0·85	26th	13
August ...	2·88	1·02	16th	11
September ...	4·07	1·24	1st	17
October ...	2·80	1·14	29th	13
November ...	3·48	0·69	3rd	21
December ...	3·46	0·75	12th	20
	29·79			154

Table M.

The following is the rainfall for the year 1887 as compared with six previous years :—

Month	1881	1882	1883	1884	1885	1886	Mean of Month	1887
	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
January ...	0·92	3·19	5·75	6·03	3·71	5·03	4·10	2·76
February...	4·81	2·56	3·73	4·40	3·65	1·32	3·41	1·45
March ...	3·88	2·26	0·60	3·39	1·87	3·97	2·66	3·21
April ...	1·44	5·68	0·67	1·56	2·52	2·98	2·47	1·63
May ...	2·62	2·72	1·90	2·37	3·86	6·38	3·31	1·94
June ...	3·59	4·28	1·81	1·92	2·61	0·70	2·48	0·60
July ...	2·62	5·77	3·56	4·05	0·72	4·85	3·59	1·51
August ...	6·94	6·75	2·09	2·21	2·74	1·68	3·73	2·88
September	2·33	3·94	6·14	1·96	6·51	3·08	4·12	4·07
October ...	3·23	8·33	4·23	1·01	5·59	5·09	4·58	2·80
November	4·98	6·26	6·38	2·12	5·47	5·39	5·10	3·48
December	4·50	4·86	1·92	5·87	1·74	6·64	4·25	3·46
	41·62	56·60	83·78	36·89	40·99	48·11	43·83	29·79

Table N.

The temperature of the year, as compared with that of the previous five years.

Months	1882.	1883.	1884.	1885.	1886.	Mean of 5 years	1887.
January ...	42°·1	40°·5	44°·5	38°·5	37°·0	40°·5	37°·5
February ...	43°·6	42°·2	42°·0	44°·1	35°·6	41°·9	40°·1
March ...	46°·3	37°·5	45°·7	42°·1	40°·7	42°·5	39°·1
April ...	48°·7	48°·1	45°·4	46°·3	48°·4	47°·1	44°·6
May ...	52°·5	52°·5	52°·7	49°·9	53°·1	52°·1	50°·9
June ...	56°·2	57°·4	58°·6	59°·2	58°·8	58°·0	61°·0
July ...	60°·1	58°·4	59°·8	63°·1	63°·0	60°·8	64°·6
August ...	60°·2	60°·0	63°·1	59°·1	62°·9	61°·0	60°·2
September	54°·3	56°·9	59°·8	51°·3	57°·6	55°·9	51°·7
October ...	50°·3	50°·1	49°·4	45°·4	52°·3	49°·5	43°·2
November	44°·1	43°·8	43°·8	44°·0	45°·0	44°·1	39°·4
December	40°·3	41°·2	41°·7	38°·8	37°·7	39°·9	38°·2

Table O.

The following is a Monthly Summary of the Meteorological Observations recorded during the year :—

MONTH	BAROMETER					THERMOMETER							HYGROMETERS		TOTAL RAINFALL
	Highest		Lowest		Mean of Month	Maximum	Minimum	Mean of Max.	Mean of Min.	Mean of Month	No. of days at or below 32 deg.		Mean of Dry Bulb	Mean of Wet Bulb	
	Date	Inches	Date	Inches	Inches.	Date	Date								Inches
January	21	30·672	6	28·868	29·967	19	52°·2	2	22°·0	42°·2	32°·9	37°·5	16	36°·6	35°·9	2·76
February	7	30·696	1	29·736	30·304	24	53°·0	17	24°·6	45°·0	35°·3	40°·1	10	38°·5	37°·0	1·45
March	2	30·644	23	29·290	30·072	29	58°·3	16	20°·4	45°·2	33°·1	39°·1	15	38°·0	36°·0	3·21
April	17	30·630	23	29·300	30·005	12	61°·4	15	29°·9	52°·6	36°·0	44°·6	2	45°·8	41°·9	1·63
May	8	30·390	20	29·350	30·033	31	66°·3	21	37°·4	57°·5	44°·3	50°·9	0	50°·9	48°·1	1·94
June	30	30·400	3	29·720	30·185	16	84°·0	1	45°·4	70°·0	52°·1	61°·0	0	62°·2	58°·3	0·60
July	1	30·330	27	29·640	30·042	3	84°·1	18	46°·9	73°·8	55°·4	64°·6	0	67°·3	62°·2	1·51
August	3	30·360	31	29·480	29·991	6	83°·2	15	44°·2	68°·7	51°·8	60°·2	0	62°·6	58°·5	2·88
September	19	30·480	2	29·220	29·937	7	61°·0	29	35°·6	55°·0	48°·5	51°·7	0	55°·3	54°·9	4·07
October	18	30·570	30	29·460	30·121	16	54°·3	26	27°·0	46°·8	39°·6	43°·2	4	46°·8	46°·3	2·80
November	16	30·350	3	28·810	29·703	3	51°·0	17	24°·8	41°·3	37°·5	39°·4	6	41°·2	41°·0	3·48
December	2	30·460	15	29·400	29·881	15	51°·3	28	25°·0	42°·1	34°4	38°·2	11	39°·9	39°·6	3·48

TABLE P.—Illustrates the Daily Direction of Wind throughout the Year

Direction of Winds	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Total.
N....	5	3	6	3	2	...	2	2	1	7	1	2	34
N.W....	2	2	5	4	9	3	6	6	8	10	4	7	66
W....	5	6	6	6	2	4	4	4	1	2	2	5	47
N.N.W....	2	...	...	2	...	...	...	...	...	..	...	..	4
S....	9	...	...	1	...	...	2	4	2	2	4	5	30
S.W....	2	1	1	2	...	3	6	...	5	1	3	3	31
E.N.E....	1	2	2	6	...	...	...	...	...	...	...	...	11
E....	3	6	6	1	3	9	...	3	3	2	2	1	35
N.E....	1	2	2	4	10	5	2	5	8	7	13	7	68
S.E....	1	...	...	1	4	6	9	7	2	...	1	1	33
N.N.E....	...	3	3	...	...	...	...	...	...	...	...	...	5

The following are the statistical returns, necessary to be considered when dealing with the sanitary condition of Cardiff, during the past year :—

The Marriages.

The total number of marriages registered from 31st December, 1886, to 31st December 1887, as furnished by the Deputy Superintendent Registrar, were :

At the Established Churches	...	415
„ Nonconformist Churches	...	219
„ Catholic Churches	...	128
„ Synagogue, &c. (Jewish)	...	...
„ Registrar's Office ...	...	560
		1,322

The Births.

The total births registered were 4277, being 10 above those of the preceding year ; of these, 2215 were males and 2062 females. The following table shows their distribution throughout the sub-districts, the birth-rates as compared with those of the large towns, as also those of the Kingdom. The excess over the two latter confirms the opinion of the Registrar General when he states that the estimated population of Cardiff is one-eighth below the probable population.

Quarter ending	Cardiff	Roath	Canton	Total	Estimated Population 104.580 Rate per 1000	28 Large Towns per 1000	Kingdom per 1000
April 2nd	468	339	295	1102	42·3	32·9	30·5
July 2nd	465	346	271	1082	41·5	32·4	31·2
Oct. 1st	409	317	323	1049	40·3	31·9	30·0
Dec. 31st	423	339	282	1044	39·9	31·8	29·4
Total	1765	1341	1171	4277	40·0	32·3	30·3

The Deaths.

The deaths were 1,259 males and 1,021 females, making a total of 2,280. The deaths were registered and distributed as under :—

Quarter ending	Cardiff	Roath	Canton	Total
April 2nd	324	194	128	646
July 2nd	307	181	96	584
Oct. 1st	260	150	105	515
Dec. 31st	262	165	108	535
Total ...	1,153	690	437	2,280

The births being 4,277 and the deaths 2,280, the former exceeded the latter by 1·997 ; the per-centage of births to deaths being 188 as against 154 that of the large towns.

The following table shews the death-rates of Cardiff (based on the two mean estimates of population, namely, 104,580 and 117,652) during each quarter and that of the entire year, as compared with the death-rates of the large towns, the smaller towns, rural parishes, and the Kingdom.

From this table it will be seen that the death-rate of the year based on the lesser estimate was 1·0 per 1,000 in excess of the large towns, 4·5 that of the rural districts, and 3·1 that of the Kingdom; but if based on the probable estimate of population it would be 1·5 less than the large towns, and the excess over the rural districts and Kingdom relatively, 2·0 per 1000, and 0·6.

	Quarter Ending				Death Rate of Year
	March	June	Sept.	Dec.	
Cardiff: Reg.-Gen.'s Estimate	24·7	22·4	19·6	20·4	21·8
„ Probable Estimate	21·9	19·8	17·5	18·1	19·3
Twenty-eight large towns ...	22·0	19·8	20·4	21·1	20·8
The 134 districts and 57 sub-districts comprising chief towns...	21·0	18·8	18·9	19·8	19·6
The remaining districts and sub-districts, comprising chiefly small towns and country parishes ...	19·8	17·2	15·2	16·9	17·3
Death-rate of Kingdom ...	20·6	18·4	17·2	18·6	18·7

The deaths and death-rates of Cardiff in each week during the year were as shown by table Q.

Table Q.

No.	Week ending	No. of Deaths	Death-rate. Estimated Population as per Registrar General, 104,580.	Death-rate Estimated Population Inhabited Houses, 117,652.	Seven Chief Zymotic Diseases		
					Deaths	Death-rate 104,580.	Death-rate 117,652
1	January 8	54	26·9	23·8	3	1·5	1·3
2	„ 15	61	30·4	26·9	4	2·0	1·7
3	„ 22	50	24·9	22·0	7	3·5	3·0
4	„ 29	52	25·9	22·9	4	2·0	1·7
5	February 5	39	19·5	17·2	1	0·5	0·4
6	„ 12	49	24·5	21·6	3	1·5	1·3
7	„ 19	47	23·5	20·7	4	2·0	1·7
8	„ 26	36	18·0	15·9	4	2·0	1·7
9	March 5	51	25·4	22·5	2	1·0	0·8
10	„ 12	58	28·9	25·6	5	2·5	2·2
11	„ 19	50	25·0	22·0	3	1·5	1·3
12	„ 26	60	29·9	26·5	7	3·5	3·0
13	April 2	40	20·0	17·6	4	2·0	1·7
14	„ 9	52	25·9	22·9	14	7·0	6·1
15	„ 16	34	17·0	15·0	2	1·0	0·8
16	„ 23	56	27·9	24·7	8	4·9	3·5
17	„ 30	71	35·4	31·3	10	5·0	4·4
18	May 7	46	23·0	20·3	5	2·5	2·2
19	„ 14	37	18·5	16·3	5	2·5	2·2
20	„ 21	54	26·9	23·8	3	1·5	1·3
21	„ 28	46	23·0	20·3	6	3·0	2·6
22	June 4	33	16 5	14·5	1	0·5	0·4
23	„ 11	43	21·5	19·0	4	2·0	1·7
24	„ 18	32	16·0	14·1	3	1·5	1·3
25	„ 25	50	25·0	22·0	7	3·5	3·0
26	July 2	30	15·0	13·2	6	3·0	2·6
27	„ 9	39	19·5	17·2	3	1·5	1·3
28	„ 16	39	19·5	17·2	3	1·5	1·3
29	„ 23	30	15·0	13·2	6	3·0	2·6
30	„ 30	33	16·5	14·5	4	2·0	1·7
31	August 6	35	17·5	15·4	6	3·0	2·6
32	„ 13	40	20·0	17·6	12	6·0	5·3
33	„ 20	52	25·9	22·9	18	9·0	7·9
34	„ 27	44	22·0	19·4	9	4·5	3·9
35	September 3	40	20·0	17·6	11	5·5	4·8
36	„ 10	46	23·0	20·3	13	6·5	5·7
37	„ 17	44	22·0	19·4	5	2·5	2·2
38	„ 24	34	17·0	15·0	4	2·0	1·7
39	October 1	40	20·0	17·6	8	4·0	3·5
40	„ 8	42	21·0	18·5	2	1·0	0·8
41	„ 15	40	20·0	17·6	7	3·5	3·0
42	„ 22	39	19·5	17·2	3	1·5	1·3
43	„ 29	48	24·0	21·2	4	2·0	1·7
44	November 5	50	25·0	22·0	4	2·0	1·7
45	„ 12	41	20·5	18·1	0	0·0	0 0
46	„ 19	35	17·5	15·4	3	1·5	1·3
47	„ 26	33	16·5	14·5	0	0·0	0·0
48	December 3	42	21·0	18·5	0	0·0	0·0
49	„ 10	36	18·0	15·9	1	0·5	0·4
50	„ 17	41	20·5	18·1	2	1·0	0·8
51	„ 24	42	21·0	18·5	3	1·5	1·3
52	„ 31	49	24·5	21·6	7	3·5	3·0

The death-rate from all causes, and the death-rate from the seven chief zymotic diseases of each quarter were as under :

	Death-rate per 1000 inhabitants, all causes, (104,580)	Death-rate per 1000 inhabitants, seven chief zymotic diseases (104,580)
Quarter ending March	24·7	1·96
„ June	22·4	2·84
„ September	19·6	3·91
„ December	20·4	1·38

This is important as showing that in determining the sanitary condition of a district there are temporary disturbing causes operating which may produce an exceptionally high death-rate entirely outside the influences over which a Sanitary Authority can exercise a control. Thus, in the first quarter the death-rate from all causes was 24·7 per 1000, the highest death-rate of a given period during the year, but the death-rate from the seven chief zymotic diseases was only 1·96.

In the second quarter the death-rate from all causes fell to 22·4, but that of the zymotic rose to 2·84. The third quarter the death-rate from all causes was only 19·6, but the death-rate from the seven chief zymotic diseases rose to 3·91. In the fourth quarter the death-rate from all causes slightly increased (20·4), but that of the zymotic diseases was only 1·38, the lowest during the year.

The special disturbing cause operating to produce the high death-rate of the winter quarter was the severity of weather that ruled the winter and early spring months, causing excessive mortality from acute diseases of local organs, especially the respiratory, among the aged and infantile population.

The deaths at ages were :—

Under one year of age	714
One year and under five years	323
Five years and under fifteen years	106
Fifteen years and under twenty-five years ...	126
Twenty-five years and under sixty years ...	642
Sixty years and upwards	369
Total ..	2280

As regards infantile mortality, Mr. Simon, in one of his early reports, makes the following observations. "The death-rates of young children are, in my opinion, among the most important in sanitary science In the first place, their tender young lives, as compared with the more hardened and acclimatised lives of the adult population, furnish a very sensitive test of sanitary circumstances, so that difference of infantile death rates are, under certain qualifications; the best proof of deficiency of household condition

in any number of compared districts; and secondly, those places where infants are apt to die are necessarily the places where the survivors are most apt to be sickly, and where, if they struggle through a scrofulous childhood to realise an abortive puberty, they beget a still less likelier brood than themselves, even less capable of labour, and even less capable of education. It cannot be too distinctly recognised that a high local mortality of children must also necessarily denote a high local prevalence of those causes which determine a degeneration of race."

The excessive infantile mortality of this year has just been alluded to, namely, the cold weather ruling the early months of the year, when the bronchitis and pneumonia were unusually fatal at this period of life.

The following is the classification of diseases adopted by the Registrar-General and the mortality in each :—

		Cardiff	Roath	Canton	Total
Class 1	Zymotic Diseases	147	122	84	353
,, 2	Constitutional Diseases	197	90	48	335
,, 3	Local Diseases	573	320	193	1086
,, 4	Developmental Diseases	163	105	92	360
,, 5	Violent and not classed	73	53	20	146
	Total	1153	690	437	2280

In the appendix will be found table 1, with an analytical return of all deaths in accord with this classification, the deaths at age from each disease, as also the death-rates. Another table will also be found in accordance with instructions issued by the Registrar-General arranged in two forms (A and B); these are intended to give information as to the extent of specific diseases amongst the inhabitants generally, as also that especially among the working and poorer classes.

I have now to direct your attention to the mortality from diseases enumerated in class 1, table 1, inserted in appendix. This class requires your serious consideration, from the fact that when these diseases prevail to any excess they are due to causes preventible or removable under a proper and effective system of sanitation, and, in fact, constitutes the principal diseases to be considered in a health report.

I have on former occasions explained the morbific poison that constitutes the essential elements of infectious matter, namely, that this consists of minute organisms, possessing a latent vitality that is called into existence under favouring influences, that these organisms are introduced into the human system by means of the air we breathe or the water we drink; when so introduced they

multiply with extraordinary rapidity and are thrown off by the excreta or eliminated by the skin, and in this manner the infection is communicated from the sick to the healthy.

There are certain diseases, more especially infectious or contagious, designated by the Registral-General as the "Seven Chief Zymotic Diseases;" these are Small-pox, Measles, Scarlatina, Diphtheria, Whooping-Cough, Fever, and Diarrhœa.

The following table illustrates the mortality from these diseases in 1887, as compared with the annual mortality of the preceeding six years.

Table R.

The following table gives the total deaths and death-rates of the seven chief zymotic diseases for each year during the six years ending 1886, with mean of same:—

Years	1881		1882		1883		1884		1885		1886		Mean of six years		1887	
Estimated Population according to Registrar General	86,015		88·603		91,204		93·468		97,034		100,736		92,844		104,580	
Seven Chief Zymotic Diseases	Deaths	Death-Rate	Deaths	Death-Rate	Deaths	Death-Rate	Deaths	Death-Rate	Deaths	Death-Rate	Deaths	Death-Rate	Deaths	Death-Rate	Deaths	Death-Rate
Small-pox	2	0·023	1	0·011	1	0·010	8	0·085	2	0·020	1	0·009	2·5	0·026	11	0·105
Measles	1	0·011	32	0·361	11	0·120	83	0·888	198	2·040	17	0·168	57·0	0·598	62	0·592
Scarlatina	20	0·232	67	0·756	42	0·460	128	1·369	26	0·267	17	0·168	50·0	0·542	11	0·105
Diphtheria	12	0·139	27	0·503	22	0·241	35	0·374	39	0·402	14	0·139	24·8	0·299	20	0·191
Whooping-cough	58	0·673	38	0·428	68	0·745	31	0·330	118	1·216	46	0·456	59·8	0·641	47	0·449
Fever	21	0·244	18	0·203	35	0·383	34	0·363	39	0·402	73	0·724	36·6	0·386	17	0·162
Diarrhœa	50	0·581	110	1·241	74	0·811	157	1·679	99	1·020	164	1·628	109·0	1·160	110	1·051
Total	164	1·903	293	3·305	253	2·770	476	5·088	521	5·367	332	3·295	339·9	3·621	278	2·658

The distribution of mortality throughout the sub-districts, with the deaths from these diseases in each street where a fatal case occurred, as also the total deaths from all causes in these streets :—

Table V. CARDIFF (NORTH).

Streets	Small Pox	Measles	Scarlatina	Diphtheria	W Cough	Fever	Diarrhœa	Total	Deaths from all causes
Bedford	...	...	...	...	1	...	...	1	7
Cairn	...	3	...	...	2	...	1	6	18
Cathays Terrace	...	...	...	1	...	...	...	1	12
Catherine	...	...	...	1	...	...	...	1	4
Castle Road	...	...	...	...	1	...	...	1	10
Coburn	...	1	...	1	1	...	...	3	10
Crwys Road	...	...	...	...	1	...	1	2	13
Flora	...	1	...	...	...	...	2	3	10
Glynrhondda	...	...	...	...	...	...	1	1	1
Letty	...	1	...	...	...	...	...	1	4
Merthyr	...	...	...	...	...	1	...	1	3
Minny	...	...	...	...	2	1	...	3	14
Miskin	...	1	...	...	...	...	...	1	9
Park Place	...	...	...	...	...	1	1	2	4
Queen	...	...	...	...	...	...	1	1	8
Richard	...	...	...	...	2	...	...	2	7
Russel	...	...	...	...	1	...	...	1	11
St. Andrew's Crescent	...	...	...	...	...	...	1	1	3
Thesiger	...	...	...	...	1	...	1	2	7
The Walk	...	...	...	1	...	...	...	1	2
Union Workhouse	...	...	...	...	2	...	7	9	189
Upper George	...	2	...	...	...	1	...	3	7
Woodville Road	...	...	...	...	...	...	1	1	12
TOTAL ...	...	9	...	4	14	4	17	48	365

Cardiff (South).

Streets	Small Pox	Measles	Scarlatina	Diphtheria	W Cough	Fever	Diarrhœa	Total	Deaths from all causes
Adam	...	1	...	...	...	...	...	1	6
Augusta	...	1	...	...	...	...	...	1	8
Buzzard	...	1	...	...	...	...	...	1	6
Caroline	...	...	...	...	...	...	1	1	3
Crichton	...	1	...	...	...	...	1	2	4
David	...	1	...	...	...	...	1	2	6
Dudley	...	...	...	...	...	...	1	1	6
Duffryn	...	1	...	...	1	...	...	2	9
Edward	...	1	...	...	...	...	...	1	7
Edward Terrace	...	...	...	...	...	...	1	1	1
Eleanor	...	...	...	...	1	...	...	1	3
Eisteddfod	...	...	...	...	2	...	...	2	5
Eveline	...	...	...	..	...	...	1	1	10
Frederica	...	1	...	...	...	...	1	2	8
Frederick	...	...	...	...	1	...	...	1	10
Gough	...	...	...	...	...	...	1	1	7
Harrowby	...	1	...	...	...	...	...	1	4
Havelock	...	...	...	...	...	...	1	1	6
Hill's Terrace	...	...	...	...	...	..	2	2	8
Hospital Ship	5	...	...	...	...	...	...	5	28
Ivor	...	1	...	...	...	...	1	2	7
Loudon Square	...	...	...	...	1	...	1	2	3
Lower Station Terrace	...	1	...	...	...	...	...	1	2
Maria	...	...	...	...	...	...	1	1	3
Millicent	...	...	1	...	...	...	...	1	13
Moira	...	...	1	...	1	...	1	3	5
Morgan	...	...	...	2	...	...	...	2	5
Mount Stuart Square	...	...	...	...	...	1	...	1	3
Nelson Terrace	...	...	..	...	1	...	...	1	4
New	...	1	...	...	...	...	...	1	1
North Church	...	2	...	...	...	...	1	3	4
Peel	...	..	...	...	...	...	1	1	8
Pendoylan	...	1	...	...	...	...	1	2	5
Plantagenet	...	...	...	...	...	...	3	3	4
St. Mary	...	1	...	...	...	...	...	1	6
Scott	...	...	...	...	...	...	1	1	13
South Church	...	...	...	1	...	...	2	3	6
South William	...	...	...	...	1	...	...	1	9
Tredegar	...	...	...	...	...	...	1	1	8
Victoria	...	...	...	...	1	...	...	1	3
Wood	...	...	...	...	1	...	...	1	2
TOTAL ...	5	16	2	3	11	1	25	63	259

Roath (North).

Streets	Small Pox	Measles	Scar-latina	Diph-theria	W Cough	Fever	Diar-rhœa	Total	Deaths from all causes
Alexander	...	...	...	...	...	1	...	1	2
Cyfarthfa	...	2	...	...	...	...	1	3	7
Castle Road	...	...	...	...	...	...	1	1	3
Charles	...	...	...	1	...	...	...	1	5
Clive	...	...	...	...	...	...	1	1	9
Crwys Road	...	...	...	...	...	...	1	1	4
Daniel	...	...	...	...	...	...	1	1	9
Donald	...	...	...	...	1	...	...	1	5
Elm	...	2	...	...	...	...	2	4	11
In a van (Gipsies)	...	...	2	...	...	...	2	4	4
Mackintosh Place	...	...	...	1	...	...	...	1	1
Milton	...	...	...	...	1	...	...	1	9
Robert	...	...	...	...	...	...	1	1	5
Rose	...	...	...	1	...	...	...	1	3
Shakespear	..	...	...	...	1	...	...	1	7
Southey	...	...	...	...	...	...	1	1	2
Treharris	...	...	...	...	...	...	...	1	5
Wordsworth	...	1	...	1	...	...	...	1	2
TOTAL		5	2	4	3	1	11	26	93

Roath (South).

Streets	Small Pox	Measles	Scar-latina	Diph-theria	W Cough	Fever	Diar-rhœa	Total	Deaths from all causes
Adeline	...	2	...	...	...	...	1	3	12
Bertram	...	...	...	...	...	...	2	2	10
Blanche	...	2	...	...	...	...	...	2	5
Broadway	...	...	..	...	2	...	...	2	18
Cecil	...	1	...	...	1	...	3	5	8
Clifton	...	1	...	..	1	...	...	2	18
Comet	...	...	...	...	...	1	1	3	7
Constellation	...	1	...	...	...	...	...	1	5
Cumrea	1	2	...	...	...	...	1	3	8
Gold	...	1	...	...	...	...	...	1	1
Gwendoline	...	...	...	...	...	...	2	2	5
Habershon	...	...	...	...	...	...	2	2	9
Helen	...	2	...	...	...	...	...	2	10
Inchmarnock	...	1	...	...	...	...	...	1	2
Infirmary	...	...	3	...	...	1	...	4	76
Carried forward...	1	13	3	...	4	2	12	35	194

Roath (South) *Continued.*

Streets	Small Pox	Measles	Scarlatina	Diphtheria	W Cough	Fever	Diarrhœa	Total	Deaths from all causes
Brought forward	1	13	3	...	4	2	12	35	194
Janet	....	2	...	...	2	...	1	5	13
John	...	1	...	...	1	...	...	2	11
Longcross	...	...	...	...	...	1	...	1	7
Metal	....	3	...	...	...	...	...	3	14
Meteor	....	...	...	1	...	...	...	1	2
Moon	....	...	...	1	...	...	...	1	5
Newport Road	...	...	...	...	...	...	2	2	6
Orbit	....	...	...	...	1	...	...	1	3
Pearl	....	2	....	...	1	...	...	3	15
Planet	....	1	...	...	1	...	...	2	9
Railway	....	...	...	...	...	...	1	1	12
Richard Terrace	...	1	...	...	...	1	...	2	12
Ruby	...	1	...	...	...	...	1	2	14
Sapphire	...	...	...	1	...	...	...	1	6
Spring Gardens	...	...	...	...	...	...	1	1	1
Sun	...	...	...	...	1	...	...	1	2
System	4	...	...	...	...	1	1	6	9
Theodore	...	...	1	...	...	...	...	1	7
Walker's Road	...	2	...	...	...	...	...	2	5
Zinc	...	...	...	...	...	...	1	1	3
Total ...	5	26	4	3	11	5	20	74	350

Canton (North).

Streets	Small Pox	Measles	Scarlatina	Diphtheria	W Cough	Fever	Diarrhœa	Total	Deaths from all causes
Conway Road	...	...	...	1	1	...	...	2	3
Cowbridge Road	...	...	...	...	...	...	3	3	11
Daisy	...	...	...	...	...	...	1	1	5
Ethel	...	...	2	...	...	...	3	5	18
Glynn	...	1	...	...	...	...	...	1	9
Ivy	...	..	...	...	...	...	1	1	1
Keswick Gardens	...	...	...	...	...	...	1	1	1
King's Road	...	1	...	1	...	...	1	3	20
Loftus	...	...	...	...	...	...	1	1	5
Penypeel Road	...	...	...	1	1	...	1	3	7
Rectory Road	...	...	...	..	...	...	1	1	4
Ryder	...	1	...	...	...	...	...	1	3
Severn Road	...	...	...	...	...	...	1	1	15
Thornhill	...	...	...	...	1	...	...	1	2
Wyndham	...	...	...	1	...	...	3	4	10
Total ...	...	3	2	4	3	...	17	29	114

Canton (South)

Streets	Small Pox	Measles	Scar-latina	Diph-theria	W Cough	Fever	Diar-rhœa	Total	Deaths from all causes
Craddock	...	...	...	...	...	...	3	3	12
Eldon	...	1	...	...	...	...	1	2	6
Heath	...	...	...	...	...	...	1	1	1
Littleton	...	...	...	...	1	...	...	1	2
Mandeville	...	...	...	...	...	1	...	1	1
Rennie	...	...	...	...	...	1	...	1	3
St. John's Crescent	..	...	...	1	...	...	...	1	1
Stephenson	...	...	...	1	...	...	...	1	1
Tudor	...	...	...	...	1	...	2	3	5
Thomas	...	...	...	...	...	...	1	1	1
Wellington	...	...	...	...	1	...	...	1	8
Total ...	...	1	...	2	3	2	8	16	41

Grangetown.

Streets	Small Pox	Measles	Scar-latina	Diph-theria	W Cough	Fever	Diar-rhœa	Total	Deaths from all causes
Bromfield	...	...	...	...	2	...	...	1	4
Bromsgrove	...	...	1	...	...	...	...	2	3
Clive	...	...	...	...	...	...	4	4	10
Hewell	...	1	...	...	...	...	...	1	9
Kent	...	...	...	...	...	...	1	1	10
Knole	...	...	...	...	...	...	1	1	4
Lucknow	...	...	...	...	...	...	1	1	1
Ludlow	...	...	...	...	...	...	1	1	2
Mathew's Terrace	...	...	...	...	...	1	...	1	4
Newport	1	...	...	...	...	...	2	2	4
North Clive	...	...	...	...	...	...	2	2	4
Station Terrace	...	...	...	...	...	...	1	1	2
Tynant	...	...	...	...	...	1	2	2	6
Van	...	...	...	...	...		1	1	2
Total ...	1	1	1	...	2	2	14	21	65

It is satisfactory to find that during 1887 the mortality from these seven chief zymotic diseases has been so much below, compared with the mean of previous six years in Cardiff, or that of the large towns; the death-rate of Cardiff being 3·6 as against 4·1 that of the large towns. It would, therefore, have been unnecessary I should in this report have entered largely into the prevalence of these diseases during the year, but for the fact that one (small-pox) broke out in February, continuing to prevail until September, at times threatening to assume large proportions, and it will be to this epidemic I shall especially call your attention.

Small-Pox.

Although the mortality from this disease has not been great—only 11 deaths having been registered during the year—still, from the circumstance that the epidemic prevailed over a period of more than eight months, at times threatening to assume serious proportions, causing considerable anxiety in the public mind and requiring a firm and vigorous action on the part of your officials to repress it, it will be my object in this report to give a short but practical outline of the past and present history of small-pox, and to do this, that I may speak with authority, it will be necessary I should draw your attention to the facts contained in a very valuable report made by Mr. John Simon to the General Board of Health, dated May 9th, 1857. In this report he makes the following trenchant remarks:—

"To the civilised classes of society, small-pox has now almost ceased to be a fatal disease; and among them, accordingly, there is a temptation to forget how their fathers and grandfathers regarded it. Hence, in the middle of the 19th century, the very success of vaccination may have blinded people to its importance. It is so easy to be bold against an absent danger—to despise the antidote—while one has no painful experience of the bane. Yet, indeed, apart from historical records, our present daily experience of the nature of the disease might almost enable us to construct a description of the course which it has run. To know of it, that it is *fatal to a very large proportion of those whom it attacks;* that it is *eminently infectious from person to person;* and that it *seizes, with very few exceptions, on all who for the first time come within its range.* This, if one reflects on it, is almost to have read the story of its ravages; and their details may be conjectured."

Again, he states, "It has been made evident by calculations from the bills of mortality of the city of London, renowned for medical science, that, at the beginning of the 18th century, about one-fourteenth of the inhabitants died of the small-pox, and during the last thirty years of that century, when the practice in small-pox was highly improved, the mortality by this disease had

augmented to one-tenth. But this immense and increasing consumption of human lives was not the sole evil produced by this distemper, for a considerable portion of the survivors were pitted and disfigured; some lost one of their eyes, a few became totally blind, and others had their constitution impaired and pre-disposed to a variety of complaints which were productive of future distress and sometimes of death. These additional calamities cannot be reduced to calculation; but as the mortality from small-pox was continually on the increase, these concomitant evils must have been so likewise."

He afterwards gives the early history of vaccination:—

"Among the dairy folk of Gloucester a tradition existed that a certain pustular eruption occasionally observed on the teats of cows extended to the subject, and that persons who had suffered from that cow-pox were by it rendered unsusceptible of small-pox. This attracted the attention of Edward Jenner, then a village doctor's apprentice in the neighbourhood of Bristol. It was never absent from his mind. Thirty years elapsed before it was borne to the public, but incessantly he thought and watched, and experimented on the subject; and the work in which at length he recorded the incomparable results of his labour may well have commanded the confidence of reflecting persons."

"In the first enquiry Jenner set on foot in 1798, he cited in detail many instances of persons who having, at earlier periods of life, accidentally contracted an infection from cows, had afterwards shown themselves unsusceptible of human small-pox; instances where the protective contagion had reached the hands of milk-women, where for twenty, thirty, and fifty years afterwards its consequences had survived; where the system, even at these distances of time, remained absolutely proof against all attempts to infect it with small-pox, *either by inoculation* or by breathing of an infected atmosphere."

He further shows that persons desirous of acquiring this protective influence needed not wait for some accidental infection, they could imitate the manœuvre of small-pox inoculation, and on any occasion when the cattle of the neighbourhood might be suffering, could let the vaccine infection be surgically transferred to themselves from the cow. He afterwards demonstrated that the protective influence of vaccine lymph might be continued in perpetuity, by inoculation from one human being to another, in the same way that the small-pox was; and he announced what, for practical purposes, might be regarded as the fulfilment of that prediction. In a succession of cases he had conducted the lymph successfully to a fifth generation from its source; and the child vaccinated last in the series had been proved *by the test of variolous inoculation* to be no less safe against small-pox than another to whom had been given a first infection from the cow.

With untiring zeal and industry Jenner prosecuted his researches. These soon attracted the attention of the most eminent physicians in this Kingdom, and, concurrently, those of Continental Countries of Europe. The subject, between 1801 and 1803, was brought under the notice of Parliament, and committees were formed, consisting of the heads of the several medical colleges of England, to report on the value and importance to be attached to vaccination, the result being that a parliamentary grant was made to Jenner in recognition of his valuable services, and from this time vaccination made great strides in spite of all opposition that has continued up to the present time.

Forty years afterwards, science supplied an authentic interpretation of Jenner's wonderful discovery. He, indeed, suspected the solution, and had hinted his meaning when he called cow-pox by the name of *variolæ vaccine*, for such, in fact, it is—*the small-pox of the cow*. It had been an old medical observation that cattle often suffered in the same epidemic with men; certain of their diseases had already been compared to human small-pox. Jenner always considered small-pox and cow-pox as modifications of the same disease, so that in employing vaccine lymph we only make use of means to impregnate the constitution with the disease in its mildest, instead of propagating it in its virulent and contagious form, as is done when small-pox is inoculated. Researches subsequent to Jenner's and extending to within the last twenty years have settled that part of the question. It has been made matter of almost familiar experiment that the infection of small-pox may, by inoculation, be communicated from man to the cow; that its result is an eruption of vesicles presenting the physical characters of cow-pox; that the lymph from these vesicles, if implanted in the skin of the human subject, produces the ordinary local phenomena of vaccination; that the person so vaccinated diffuses no atmospheric infection; that the lymph generated by him may be transferred with reproductive powers to other unprotected persons; and that, on the conclusion of this artificial disorder, neither renewed vaccination nor inoculation with small-pox can have any effect.

The identity of variola (small-pox) and vaccinia (chicken or cow-pox) affords an explanation of the immunity resulting from the latter, and is in accord with the popular theory that the individual who has suffered from certain infectious diseases, such as small-pox, measles, scarlatina, and whooping-cough, are henceforth free from a probable recurrence, such insusceptibility being in direct ratio with the severity of the attack. The absolute force of this theory has, however, to be accepted with reservation, as we know that a second and third recurrence of small-pox may take place in the same individual; these, however, are so comparatively rare as to warrant a recognition of a possible immunity. Careful observation

has led one to believe that the immunity of the individual who has been vaccinated does not last so long as if he had suffered from small-pox, still, for that limited period, it is equally effective; it is, therefore, much to be regretted that the limitation cannot be defined. It is now well known that a patient who has suffered from small-pox, even in a severe form, may have a recurrence of the disease.

A well-marked instance of the relative immunity afforded by small-pox and cow-pox came under my personal observation in 1857, when small-pox prevailed in Cardiff in a very severe form. During its prevalence I received a message to visit a farm-house near St. Mellons, wherein was supposed to be a case. I took with me a supply of vaccine lymph, and on reaching the house I found the patient to be a lad between 15 and 16 years of age, who was suffering from the disease in a confluent form. In the same room and attending on him was a married sister, who was pitted and scarred from an attack of small-pox from which she had suffered in early life; in her arms she had a young baby. I vaccinated the whole of the inmates of the house with the exception of the female I have just alluded to. She, for an obvious reason, I did not vaccinate, but I did vaccinate the infant. Twelve days after my first visit my attention was called to this poor woman, who was suffering from head-ache and feverishness. When I saw her, she had put the baby to the breast in the hope that this might relieve the head-ache. Two days afterwards she developed small-pox in a severe confluent form, but the child she nursed, and was nursing at the time of her premonitory symptoms, had been successfully vaccinated, and so had the whole of the inmates of the house, all of whom escaped the disease.

With these preliminary remarks I now pass on to the past and present history of small-pox in Cardiff since 1847 (the period during which I have acted as your medical officer), and I have to direct your attention to the degree to which it confirms the remarks I have just enumerated, relative to the protective influence afforded by vaccination. For this purpose I again divide the periods into four decades, as will be seen by the following tables. These show the total deaths from small-pox and the per-centage of deaths from small-pox to total deaths.

During the first decade there were two epidemics of small-pox. The first commenced in 1847 and continued to 1848, with a mortality of 66. The second commenced in 1852 and continued to 1853, with a mortality of 117. The total deaths during the ten years were 6,535; the deaths from small-pox 191; the per-centage of deaths from small-pox to total deaths, 2·92.

In the second decade there were also two epidemics. The first commenced in 1857 and continued to the early part of 1858, with

a mortality of 169. The second broke out in 1864 continuing to 1865, with a mortality of 78. The total deaths during these ten years were 8,199; the deaths from small-pox 253; the per-centage of deaths from small-pox to total deaths 3.08.

In the third decade there was only one epidemic. This broke out in the end of 1871, continued to 1872 and the early part of 1873, with a mortality of 76. The total deaths during the ten years 10,310; the total deaths from small-pox 88; the per-centage of deaths from small-pox to total deaths, 0·85.

During the last decade also there was only one epidemic, and this prevailed only to a slight degree, namely, in 1884, when there were 8 deaths. The total deaths during the ten years, 18,092; the deaths from small-pox 18; the per-centage of deaths from small-pox to total deaths, 0·09.

Year	Deaths all causee	Deaths Small-pox	Per centage
1847	481	11	2·27
1848	579	55	9·50
1849	864	5	0·57
1850	485	2	0·41
1851	521	...	...
1852	620	75	11·58
1853	644	42	6·52
1854	925	1	0·10
1855	641	...	...
1856	772	...	...
Total	6535	198	2·92

Year	Deaths all causes	Deaths Small-pox	Per centage
1857	883	161	18·23
1858	753	8	1·06
1859	826	...	...
1860	662	...	...
1861	837	1	0·12
1862	695	3	0·43
1863	862	...	...
1864	932	34	3·64
1865	867	44	5·07
1866	882	2	0·22
Total	8199	253	3·08

Year	Deaths all causes	Deaths Small-pox	Per centage
1867	870	...	...
1868	843	4	0·47
1869	1005	4	0·39
1870	903	...	...
1871	891	13	1·45
1872	916	55	6·00
1873	995	8	0·80
1874	885	2	0·22
1875	1547	1	0·06
1876	1455	1	0·06
Total	10,310	88	0·85

Year	Deaths all causes	Deaths Small-pox	Per centage
1877	1475	1	0·05
1878	1468	1	0·06
1879	1428	...	...
1880	1634	1	0·06
1881	1556	2	0·12
1882	1724	1	0·05
1883	1807	1	0·05
1884	1250	8	0·05
1885	1481	2	0·08
1886	1269	1	0·04
Total	18,092	18	0·09
1887	2280	11	0·48

These tables unmistakably indicate the great protective influence afforded by vaccination.

An examination of the figures contained in these four decades will show that the mortality from small-pox had been reduced relatively from ten per cent. (that being the mean these deaths from small-pox bore to total mortality of the Kingdom previous to the adoption of vaccination) to 2·92 and 3·08, enumerated in the two first decades. Parents, owing to carelessness, or, possibly, unwillingness to incur a charge, did not avail themselves of the protection to be afforded by vaccination. To overcome this an Act of Parliament was passed in 1853 enabling Boards of Guardians to enter into contracts with their medical officers, or other duly qualified practitioners, to vaccinate all children brought to them free of cost, without pauperising those who made such application. To carry out the objects in view, in 1867 another act was passed making vaccination compulsory, and, in order to carry out this object, Boards of Guardians were required to sub-divide their several Unions into districts, and to appoint a public vaccinator for each district, whose duty it should be to vaccinate all children brought to him free of cost. It was also provided that these districts should be sufficiently populous to enable the vaccinator to keep up a supply of fresh lymph, it being deemed essentially necessary to render the vaccination effective it should be done with fresh lymph.

A vaccinating officer was also to be appointed, whose duty it was to see that the requirements of the act were enforced.

The advantages to the public health accruing from this act may be recognised by the greatly diminished mortality from small-pox in Cardiff during the two latter decades, when it fell to 0·09.

I have now to submit to your notice a detailed description of the epidemic of small-pox that prevailed in this district during 1887. The infection may be said to have been introduced in the last month of the previous year, as, on the 5th December, a vessel named the Albanio arrived at this port having on board a seaman suffering from the disease. He was removed into the infectious hospital.

[I may here impress on your mind that Cardiff is at all times exposed to the danger of such an introduction owing to the extensive shipping trade carried on here.]

In 1864 the source of infection was introduced by a seaman from Hull, where the small-pox at the time prevailed; and in 1871 by a seaman from Havre, who, on being removed from his vessel and received into a seamen's boarding house in Bute Road, spread the disease throughout that district. It will be noticed in my previous reports, that, annually, one or more deaths are registered; these occurred chiefly in the infectious hospital, and are seamen who, on arrival, are suffering from the disease. To obviate these dangers, whenever a case of small-pox amongst this class is reported, a strict supervision is maintained by your inspectors over

all seamen's boarding houses; the necessity arising from the circumstance that whenever a vessel arrives here, the whole of the crew, having completed the terms of their engagement, are discharged and leave the vessel.

I recur to the origin of the recent epidemic. I may now state that the last week of December a case of small-pox was reported to me at a house in Comet Street, Roath. On visiting the house I learned from the medical gentleman in attendance that this was the second case occurring in the same house, but, in explaining the circumstances, he mentioned that in the first case (the patient who was employed at the docks) the disease was of such a mild character that he considered it to be chicken-pox. The patient became convalescent, and resumed his work. The second patient occupied the same sleeping apartment during the illness of the first patient, and the disease now being in a more confluent form he thought the first case was that of modified small-pox.

On the 14th February, my attention was called by the medical attendant to a case of small-pox in System Street; this street is contiguous to Comet Street. When I visited the house I found the eruption was in an advanced stage, and had assumed the confluent form. The medical attendant had taken every precaution to carry out sanitary provisions. The premonitory symptoms of the disease appeared on the 4th, and when the medical man had reason to believe these to indicate small-pox he took all necessary precaution to prevent further extension; and, about the 8th or 9th of the month, he had induced all the inmates to be vaccinated or re-vaccinated as the case may be. With one exception they all complied; but a lad, aged 16 years, had a slight eruption on him when I visited the house; this was small-pox in a very modified form; it, and the vaccination vesicle running a concurrent course. The lad, therefore, had imbibed the infection of small-pox at the time he was vaccinated. On my visit I examined the arms of the young man who had refused to be vaccinated, and failing to detect any indication of successful primary vaccination, I again urged upon him to submit, but without success. On the 20th he sickened with small-pox and died on the 2nd March.

The following tables show the streets, the number of cases in each street, number of houses infected, and the sequence of cases arranged in districts.—

Table S.

Streets	No. of Cases	No. of Houses Infected.
System	8	4
Constellation	2	2
Comet	2	2
Eclipse	3	2
Blanche	1	1
Ordell	1	1
Prince Leopold... ...	1	1
Clyde	1	1
Railway	4	3
Galston	1	1
Cycle	1	1
Iron	1	1
John	1	1
Pearl	1	1
Cecil	1	1
Clive (Grange)... ...	2	2
Newport „	1	1
Tresillian Terrace ...	1	1
Harrowby	1	1
Scott	1	1
Little Frederick ...	1	1
Giles Court (David) ...	1	1
Thomas	1	1
Moira	1	1
Tyndall	5	4
Pendoylan	1	1
Frederica	1	1
Christina	1	1
North William... ...	2	2
Bute	2	1
Cowbridge Road ...	1	1
Broadway	1	1
West Bute	1	1
Salisbury Road... ...	1	1
Wells	1	1
Ivor	1	1
Bradford (Grange) ...	1	1
Mount Stuart Square ...	1	1
Letty	1	1
Thesiger	1	1
TOTAL ...	61	53

Table T.

Week Ending	Cardiff	Roath	Canton and Grangetown
February 19th ...	...	2	...
,, 26th ...	...	1	...
March 12th ...	...	2	...
,, 19th ...	...	2	...
,, 26th ...	...	3	...
April 2nd ...	...	2	...
,, 9th ...	...	2	2
,, 16th ...	1	1	...
,, 23rd ...	2	2	...
,, 30th ...	1	3	...
May 7th ...	1	3	...
,, 14th ...	4	1	...
,, 21st ...	4	1	1
,, 28th ...	3	2	2
June 4th ...	...	1	...
,, 11th ...	...	...	...
,, 18th ...	...	1	1
,, 25th ...	...	1	...
July 9th ...	...	...	...
,, 16th ...	1	...	1
August 6th ...	1	...	...
,, 13th ...	...	...	1
,, 20th ...	1	...	...
,, 27th ...	...	...	1
September 10th ...	2	...	...
,, 24th ...	1	...	...
TOTAL ...	22	30	9

From these tables it will be seen that up to the 9th of April the epidemic was confined entirely to Roath; after that date it made its appearance on the southern side of Cardiff—Canton and Grangetown. Only three cases occurred on the northern side of either Roath, Cardiff, or Canton. This epidemic prevailed continually until September 20th.

Immediately the disease showed itself at Roath every possible sanitary precaution was taken to repress its prevalence, and, if possible, stamp it out; but there was one difficulty, a most important one, which I had to contend with. The infectious hospital, from the nature of its construction, the severity of the weather, and the opinion of the medical attendant, did not permit of the removal of cases into it, and it did not become available until April, when the weather had ceased to be a difficulty. After this date it proved to be of great service, and 32 cases were removed into it.

The sanitary precautions rigidly enforced were as follows:—

Immediately a case came under my observation, isolation or removal into the hospital was enforced. In a case of removal the sick room was taken charge of by one of your inspectors; the room was fumigated for some days with either sulphuric acid or chlorine gases. The first was effected by means of burning sulphur in the proportion of one pound to every 1,000 cubic feet space contained in the room, the other by the employment of an admixture of chloride of sodium (common salt) bin-oxide and manganese, and sulphuric acid, slightly diluted. These operations were carefully conducted under the supervision of your inspectors for three days. The walls and ceilings of the rooms were scraped and afterwards saturated with a concentrated solution of carbolic acid; the floors were also thoroughly washed with the same, and all clothing, bedding, and other materials that had come in contact with the patients were destroyed by my order, compensation being made to the owner of all articles destroyed.

In cases where the patients could not be removed they were placed under the care of competent nurses, and, beside the use of chemical disinfectants, the rooms occupied by the patients were night and morning exposed to the action of disinfecting sprays, by means of vaporizers, the latter being carried out by your inspectors. After the recovery of the patient, the rooms were subjected to the action I have described when the patient had been removed.

At my first visit I always examine the whole of the inmates as to their state of health, and whether vaccination or re-vaccination was necessary, and, when so, urged its adoption, and it was satisfactory to find that I had little difficulty in getting this advice followed.

A house to house visitation was made in all streets where a case of small-pox occurred, as also in contiguous streets, on alternate days, so that by no possibility could any subsequent case occur without coming under my observation.

Printed instructions were left at each house, urging the expediency of re-vaccination. The vaccination officer was also directed to make an inspection of infected districts and examine the arms of all children under the age of 15 years, with the view of ascertaining the efficiency of vaccination. He was also instructed to obtain from those in charge of all elementary schools permission to examine the arms of all children attending the same.

I here insert a return of the extent of duties in this direction carried out by this officer; and to the parents of all children ascertained by him to be unvaccinated, a notice was sent to have this operation carried out within a very limited period. I submit the following return, which indicates the active and zealous manner in which this officer, Mr. Matthews, discharged his duties.

Table U.

List of Schools and Streets Inspected for Vaccination, 1887.

Name of School or Street	Total Examined	Not Vaccinated	Date of Notice	Since Vaccinated	Remaining
National Schools, Grangetown	299	4	22nd April, 1887	4	...
R. Catholic Schools, ,,	248	11	27th ,, ,,	11	...
Mr. Buck's School, ,,	91	1	,, ,, ,,	1	...
Board Schools, South Splot.	1415	24	30th ,, ,,	24	...
Roman Catholic, Tyndall Street	260	9	,, ,, ,,	9	...
Railway Street	253	16	5th May ,,	16	...
Tredegarville National Schools	361	10	,, ,, ,,	10	...
St. David's Roman Catholic	444	14	6th ,, ,,	14	...
Metal Street Schools	709	11	12th ,, ,,	11	...
St. Peter's Roman Catholic ...	432	5	,, ,, ,,	5	...
Board School, Stacey Road ...	956	11	,, ,, ,,	10	1
Pendoylan Street	74	...			...
Thomas Street	77	3	14th ,, ,,	3	...
St. John's National Schools ...	300	13	,, ,, ,,	13	...
Frederica Street	119	6	17th ,, ,,	6	...
Nelson Street	20	3	,, ,, ,,	3	...
Francis Street	45	3	,, ,, ,,	3	...
Christina	132	8	,, ,, ,,	8	...
Tyndall Street	194	10	18th ,, ,,	10	...
Herbert Street	85	9	19th ,, ,,	9	...
Tresillian Terrace	76	8	21st ,, ,,	8	...
Harrowby Street	103	3	3rd June ,,	3	...
Scott Street	150	10	,, ,, ,,	10	...
Pearl Street	469	16	13th ,, ,,	16	...
Board School, Wood Street ...	680	31	16th ,, ,,	31	...
Temperancetown National Sch.	80	6	,, ,, ,,	6	...
John Street, Roath	186	11	,, ,, ,,	10	1
Cecil Street, Roath	234	10	25th ,, ,,	9	1
Halket Street, Canton ...	69	6	,, ,, ,,	6	...
North Morgan Street, Canton	25	2	,, ,, ,,	1	1
South ,, ,, ,,	86	6	,, ,, ,,	6	...
Picton Place, Canton	74	1	,, ,, ,,	1	...
West Bute Street	57	1		1	...
Nat. Schools, Mount Stuart Sq.	297	13	29th July ,,	13	...
Board Schools, Eleanor Street	420	7	,, ,, ,,	7	...
Salisbury Road	102	7	8th August ,,	4	3
Cranbrook Street	91	2	,, ,, ,,	2	...
Coburn ,, ...	261	13	,, ,, ,,	12	1
Richard's ,, ...	239	11	13th ,, ,,	10	1
Harriett ,, ...	208	12	,, ,, ,,	11	1
Fitzroy ,, ...	53	3	,, ,, ,,	3	...
Thesiger ,, ...	161	2	,, ,, ,,	2	...
Wells ,, ...	139	9	15th ,, ,,	8	1
Ivor ,, ...	58	2		2	...
Bradford ,, ...	86	2		2	...
Cairns ,, ...	502	23	24th Sept. ,,	19	4
TOTAL ...	11,420	388		373	15

In these returns it is satisfactory to find the efficiency of vaccination. Taking the total number of unvaccinated, the proportion did not exceed five per cent., and of this per-centage, three-fifths would be under the age of three months, and, therefore, in these cases, vaccination could not be enforced.

Arrangements were also made with the public vaccinators of each district, that, on receiving notice of an infected house, he was required to visit such immediately, and vaccinate or re-vaccinate, as the case may be, all the inmates. He was, moreover, required to fix an hour and place in each evening where anyone applying to be vaccinated might attend.

It is satisfactory to know, that although the epidemic existed in the town for a period of nine months, during which time it was scattered over a large area, that out of 53 houses there were only seven where more than one case occurred, although many of these houses were situated in streets occupied by Irish families; therefore, likely to be over-crowded, such as Thomas Street, Tyndall Street, Pendoylan Street, North William Street, Giles Court, and Little Frederick Street; and out of 40 streets there were only eight where a second house in the same street was infected; and out of the 61 cases there were only 11 deaths, being a death-rate of 0·105 as against the mean death-rate of the Kingdom extending over a period of 30 years of 0·221.

Before leaving this portion of my report, I desire to place on record my sense of the very valuable assistance I received from your then Chief Inspector Gover, and Messrs. Leyshon, Vaughan, and Hellerman, during a period of great anxiety to myself; and it was by the untiring zeal and energy with which these officials discharged their duties—duties fraught with much personal danger to themselves—that the public safety was greatly promoted.

Measles.

Amongst the zymotic diseases there are three especially pertaining to early life, hence they are called infantile epidemics. These are Measles, Scarlatina, and Whooping-Cough.

Measles is a very infectious disease, and when introduced into a district attacks all who are susceptible, and on its subsidence passes away entirely; recurring at longer or shorter intervals, its severity depending very much on the increment of infantile population and temperature prevailing at the time.

On the formation of Board Schools, I foreshadowed a danger to be apprehended from the circumstance that a large number of children assembled together for educational purposes—children attending school, themselves free from the disease, but coming

from infected houses—might bring with them infective matter and thus bring be the means of spreading it amongst their fellows, and, through them, throughout the immediate neighbourhood; and, in 1884, this did occur.

On my attention being directed to an outbreak of measles in Grangetown I visited the locality, and discovered that in 78 houses in which measles at the time existed, there were 27 from which children were at the time attending school. The epidemic prevailed with great severity and corresponding mortality. From October, 1884 to June, 1885, 281 deaths were registered from measles. I then placed myself in communication with the chairman of the school-board, and at his request a special meeting was convened. At this meeting I was present and, I forcibly explained to them the dangers to be apprehended. Active measures were immediately adopted to meet the exigency of the case. Additional school board attendance officers were temporarily appointed to visit the houses of all children attending school, and on these officials reporting to me any cases of sickness coming under their observation, such were visited, and, if found necessary, a notice was served on the heads of families to prevent children from such houses continuing attendance at school until these houses were certified to be free from infection. The attention of those in charge of large public schools was called to the dangers that might result when this notification was isolated. The result was most satisfactory, as, although the epidemic subsequently prevailed throughout the whole of the Urban District, its severity was reduced to a minimum degree.

During the first ten days of January, three deaths from measles were registered in the sub-district of Canton; and no other deaths from the disease were registered until March, when it appeared in an epidemic form in Roath and Cardiff, afterwards prevailing more or less throughout the year. I may here observe that a difficulty obtains in carrying out a most essential sanitary precaution, namely, isolating children suffering from the premonitary symptoms of measles—similar in character to ordinary catarrh. Without any intention on the part of the parents, they fail to preserve proper precautions; allow them to mix with other children until an eruption appears; but the disease is equally infective during its premonitary stage.

The total deaths registered during the year were 62, with a death-rate of 0·592, as against 0·598, the mean of the previous six years.

Scarlatina.

The deaths from Scarlatina during 1887 were 11, the death-rate 0·105, the mean of the previous six years being 0·542.

Scarlatina.

Scarlatina may be considered to be the most infective of the zymotic diseases from the circumstance that its morbific poison is eliminated from the system of the patient through the several secreta and excreta, and by none more freely than by the skin, especially when the eruption has been profuse. It is very volatile, and diffusible throughout the atmosphere of the sick chamber, and unless great precautions are taken, throughout the whole house. The infection, which consists of organic matter, may deposit itself on the clothes of all exposed to it, and thus be the means of conveying it to others; hence, the dangers to be apprehended such as I have described when dealing with measles. The success afforded by the precautions taken in 1884—described in the sanitary precautions necessary to be adopted in measles—have since been actively carried out when any case of zymotic diseases has been brought under my observation, and in none has the result been more marked than in scarlatina. In 1882, the total deaths registered from scarlatina were 67, the death-rate being 0·756; in 1883, 42 deaths, death-rate 0·460; 1884, 128 deaths, with a death-rate of 1·369. After this year, when the precautions were actively adopted, the mortality fell to 26, the death-rate being 0·267; in 1886, to 17, and in 1887 to 11.

It is with great satisfaction I bear testimony to the very efficient co-operation I have on all occasions received from those in charge of the whole of the public schools in this town.

I may also observe, that although the disease is especially communicable from the sick to the healthy—from the circumstances I have described—there is none more amenable to sanitary precautions, such as isolation. As far as practicable, the care of the sick was entrusted to a competent nurse; none other being permitted to enter the sick chamber. The atmosphere of the room at intervals carefully exposed to the action of a disinfectant spray by means of a vaporizer—kept in stock at your stores, and which was lent to the nurse, who was properly instructed as to its use. Chemical disinfectants were placed in all vessels used to remove the excretal and other discharges before being thrown into the soilpipe. Linen articles used to wipe away the nasal and other secretions were immediately destroyed; and when desquamation commenced the patient was bathed with water containing dissolved carbolic soap. All articles of linen and clothing in contact with the patient (previous to being washed) were placed in tubs containing water with a prescribed quantity of carbolic or such-like disinfectant, and afterwards exposed to the action of dry air heated to a temperature of 240°, such as obtained in your disinfecting chamber. The sick room was dealt with in a like manner to those spoken of as being necessary in cases of small-pox.

Diphtheria.

The total deaths from Diphtheria were 20, giving a death-rate of 0·191, as against 0·299 the mean death-rate of the six previous years. The same general sanitary precautions are recommended here as in cases of scarlatina.

Whooping-Cough.

There were 47 deaths registered from Whooping-Cough, the death-rate being 0·449, against 0·641 the mean of the six previous years. The disease prevailed more or less throughout the entire year. The mortality was chiefly during the colder months of winter and early spring. A greater difficulty with regard to sanitary precaution necessarily presents itself, owing to the circumstance that the disease in each case extends over a lengthened period; isolation, as a matter of fact, being impossible.

Typhoid Fever.

The mortality from Typhoid Fever was considerably less in 1887 than during many recent years, the deaths numbering only 17, with a death-rate of 0·16; the mean of the six previous years 0·38. It is equally satisfactory to find that it compares most favourably with the mortality of the large towns from fever in 1887, that being 0·21.

In 1886, Cardiff was visited with a very severe epidemic of typhoid, causing a mortality of 73 and a death-rate of 0·72.

On enquiring into the history of this epidemic, I found that it followed certain main sewers to the exclusion of others. Typhoid fever is essentially an abdominal disease; the infective matter consists of specific organisms eleminated through the dejecta of the patient. If, therefore, care and cleanliness in the treatment of the latter have been observed, the disease does not extend to other inmates of the house; but it is essentially necessary that the vitality of the organisms contained in the dejecta should be destroyed by means of concentrated chemicals of disinfectants being thrown down the soilpipe. It was greatly owing to an omission to observe this care that explained the circumstance why the epidemic followed the course of certain named drains. The organisms contained in the dejecta, not having been destroyed before being thrown into the soil-pipe, find, in the contents of these sewers, all the essentials necessary to take on activity; and, rising with the gaseous exhalations, are conveyed to the houses where defective sewer arrangements exist, and it was under such circumstances that cases of enteric fever were especially observed. It has, therefore, been my urgent desire, and in my frequent reports to your Board I have constantly urged, that the necessary sanitary precautions be taken.

As regards the typhoid fever cases reported to me in 1887, in some of those there was an absence of abdominal symptoms, and the petechial spots usually observed in epidemic typhoid—although all other fever symptoms were present--leading the medical attendant to certify the death as due to typhoid when it might possibly be sporadic or simple continued fever.

Diarrhœa.

Diarrhœa—like typhoid fever—as its name would imply, is an abdominal disease.

During the last few years, my attention has been directed to the causes operating to produce diarrhœa, and as I have stated that when it is not a symptom of, as distinguishing from, disease, the exciting or predisposing causes are chiefly due to age, temperature, and diet. As regards age, diarrhœa prevails as an epidemic during autumnal months, and from the circumstance that it is largely confined to early life, it has been called infantile diarrhœa; and at this time temperature constitutes an important element by producing rapid changes in the constitution or condition of the food (milk) given to infants.

In 1882, Dr. Ballard, Medical Inspector of the Local Government Board, urged me to enquire into all circumstances connected with the prevalence of autumnal diarrhœa in Cardiff, and, in carrying out his suggestions, I found that infantile diarrhœa especially prevailed in those parts of the town where the houses were built on a flat, namely, the southern section. In these portions the sewers were laid with such low gradients—as I have described--that the fluid contents in times of drought did not pass away with sufficient rapidity, and the exhalations which escaped from the ventilating shafts and untrapped grids poisoned the atmosphere with minute organisms. These organisms possess the power of selection, and find their way into the milk used for feeding infants; producing those changes that at this period of the year take place with great rapidity; these changes now being recognized as due to minute organisms rather than chemical changes, and in the parts of the town I have just described these organisms are more abundant in the atmosphere than in other parts. Confirming this opinion, I may state that noxious and offensive exhalations were here a subject of constant complaint by occupiers of houses in close contiguity to these shafts and grids, and it frequently came to my notice, that on enquiring into the history of a death from infantile diarrhœa, the milk used for its food had been kept in a pantry where the atmosphere was polluted with the exhalations of sewer gas.

The year 1887 presented all the essentials necessary to produce an unusual amount of mortality from infantile diarrhœa, namely,

a very high temperature and a persistent drought. To guard against these dangers—in the latter part of June, when the temperature became exceedingly high, and an absence of storm-water —I caused the drains laid with a low gradient to be flushed daily with water containing iron salts and other chemicals, and to this sanitary operation I believe the diminished mortality from enteric fever and diarrhœa has been greatly due.

The total deaths from diarrhœa in 1887 were 110; the death-rate 1·05; the mean of the previous six years being 1·16.

Notification of Diseases.

Before leaving this part of my report, it is my duty, urgently, again to impress on you the necessity for providing a suitable hospital for the reception of cases of infectious diseases in place of the present one, which is becoming more and more unsuitable.

I need hardly point out to you that the absence of such an institution will, sooner or later, be most disastrous to the public health. In consequence of the unfitness of the present hospital serious results did occur—as I have reason to know—when the recent epidemic of small-pox first showed itself in System Street. Owing to the inclemency of the weather, and the faulty condition and construction of the annex to the Hamadryad Hospital Ship, I, and the medical gentlemen in attendance, determined that we dared not urge the removal of the patient; and to this circumstance I can but attribute the extension of the disease to other houses in this and adjoining streets. When the weather changed the objection to the removal of the patient no longer existed—the most satisfactory results followed. When a case was reported to me and the removal effected, a second case in the same house or street rarely occurred. In a former report I stated to you that a committee were engaged in endeavouring to carry out arrangements with the representatives of Lord Bute, by which an infectious hospital (equally applicable to the district and the port) might have been erected. This arrangement is still incomplete; I therefore most strongly urge on your Board to carry it out, or to determine some other solution of the existing difficulties.

Closely connected with this is another matter, little less important; namely, the necessity of obtaining powers to enforce the notification of cases of infectious diseases to the Medical Officer of Health. In my last report I stated there were two ways of carrying out such a provision, namely, compulsory—as applicable to the head of the family, or the occupier of a house in which a case of infectious disease has occurred—or by a voluntary arrangement with the private medical practitioner by which such information may be obtained on payment of a small fee. Each has its advantages, but in some towns the dual system has been

adopted with great advantage. Its necessity still exists, although it is only due to my professional brethren to acknowledge that they have rendered me most valuable aid; but, during the year, it has again and again occurred that children and inmates of infected houses have communicated the disease to others, and in more than one instance the disease has been small-pox.

The mortality of diseases included under the classification of constitutional, local, and developmental, requires no special observations. They are diseases due to natural causes, notably climatic, and, taken to extend over a sufficiently lengthened period (as will be seen below), vary but little. They have no important bearing on sanitation, except when some disturbing influences prevail—weather and such-like temporarily produce a high death-rate, a circumstance to which I have already alluded.

Year	Constitutional Death-rate	Local Death-rate	Developmental Death-rate	Violent Death-rate
1881	3·441	8·428	2·441	1·197
1882	3·318	8·003	9·210	2·741
1883	3·102	9·210	2·741	1·293
1884	3·423	10·097	3·263	1·326
1885	4·122	10·924	3·091	1·184
1886	4·305	10·373	3·563	1·309
Mean of six years	3·452	9·506	2·985	1·267
1887	3·203	10·384	3·442	1·400

Violent deaths are regulated by the nature of employment of the working classes, and when such employment exposes this class to the chances of accident, as in Cardiff, the death-rate from these causes is correspondingly high. The deaths from violence during the year were 1·400 per 1,000. That of the mean of Kingdom being 0·750.

Subjoined is a summary of work done during the year 1887 by your executive:—

14,923 day and 1,002 night visits have been made and the results duly reported, exclusive of 14,392 incidental house visitations made when enquiring into the possibility of existing cases of sickness.

43 houses were found to be over-crowded. In each instance notices were served upon the occupiers to reduce the number of inmates. In one instance only it was found necessary to institute legal proceedings, when the occupier was fined 10/- and costs.

The occupiers of 510 houses were served with notices to cleanse and whitewash houses; brushes being lent out for this purpose 1572 times.

273 closets and surface drains in a defective condition were cleansed and the nuisance abated.

89 drains were tested, either by essential oils or the "Asphyxiator." In two instances proceedings were taken before the Magistrates.

26 cesspools were emptied and disinfected; 15 have been abolished, and the house-drains connected with the main sewers.

290 houses, or parts of houses, have been fumigated after cases of infection.

162 bakehouses were inspected at intervals during the year. 32 occupiers were served with notices to lime-wash the premises.

127 cow-sheds, and 98 milk-shops were inspected. Notices were served upon the occupiers to lime-wash these during the months of June and November.

The common lodging-houses and boarding-houses have been kept under constant supervision. Cleansing and lime-washing have been thoroughly enforced when necessary.

368 lbs. of beef, mutton, and veal; 4 boxes of mackerel; 2 cwt. of gurnet; also 58 tons of potatoes have been destroyed; and proceedings were taken before the Magistrates when necessary.

The following is a list of clothing and bedding treated at your disinfecting chamber:—

Articles	Disinfected	Destroyed
Beds ...	32	7
Mattresses ...	47	11
Blankets ..	47	8
Quilts ...	29	5
Sheets ...	42	3
Bolsters ...	46	8
Pillows and Slips	146	31
Carpets ...	20	5
Articles of Clothing, &c.	746	56
TOTAL	1155	134

It now only remains to me, in concluding a report that terminates my connection with your Board—and I desire to do so in all sincerity—to express my great appreciation of the very generous confidence and support you have afforded me in my great difficulties and anxieties, and thus enabled me to discharge the duties of my office to the advantage of the public.

I have the honor to be, Gentlemen,

Your obedient Servant,

H. J. PAINE, M.D.,

Medical Officer, Cardiff Urban Sanitary Authority.

APPENDIX No. 2.

CARDIFF URBAN SANITARY DISTRICT.

Deaths Registered at Ages from the several Causes during the Year 1887.

CAUSES OF DEATH.	AGES.															Total.	As per Registrar General's Estimate 104,580	As per Registrar General's probable Estimate, 107,652.
	Under 1 Year	1 Year	2 Years	3 Years	5 Years	10 Years	15 Years	20 Years	25 Years	35 Years	45 Years	55 Years	65 Years	75 Years	85 Years			
CLASSES.																		
I. Zymotic Diseases ...	131	67	30	18	24	3	4	9	16	8	8	9	6	4	1	353	3'373	3'003
II. Constitutional ...	31	19	8	9	8	6	15	24	67	56	41	18	3	5	5	335	3'203	2'847
III. Local ...	295	72	34	26	29	21	19	23	73	58	117	54	24	148	45	986	10'384	9'230
IV. Developmental ...	231	11	1	1		1	3	3	13	4	1	1		32	44	14	360	3'442	3'059
V. Violent Deaths ...	11	5	2	3	9	4	13	13	14	12	11	7		8			108	1'032	0'917
Sudden Deaths, cause unascertained	15		1						1	4	3	6	1	4			38	0'363	0'322
Totals ...	714	175	76	72	70	36	50	76	187	181	184	90	27	223	98	21	2280	21'801	19'379
CLASS I. ZYMOTIC																		
Small-Pox ...	1			1		1		3	4		1					11	0'105	0'093
Measles ...	13	25	13	8	3											62	0'592	0'536
Scarlet Fever ...	1	2	4	3	1											11	0'105	0'093
Diphtheria ...	1	1	2	7	6				2	1						20	0'191	0'169
Quinsy ...		1	1	2	1							1				4	0'038	0'033
Croup ...	3	6	2	7	8											26	0'248	0'221
Whooping-Cough ...	19	17	7	4												47	0'449	0'398
Enteric or Typhoid Fever ...					1	1	1	4	2	2	1	1				16	0'152	0'135
Simple Continued Fever ...			1													1	0'009	0'008
Erysipelas ...	1						1	1				1			1	5	0'047	0'042
Puerperal Fever (Metria) ...								1								1	0'009	0'008
Dysentery ...						1					1					2	0'019	0'017
Diarrhœa ...	73	13	1	2	2		1		2	2	3	5		2	1	110	1'051	0'934
Pyrexia ...	1											1				2	0'019	0'017
Rheumatism ...							1		1					3		5	0'047	0'042
Other Zymotic Diseases ...							1									1	0'009	0'008
Syphilis ...	11	1							1							13	0'124	0'110
Want of Breast Milk ...	3															3	0'028	0'025
Alcohol { a. Delirium Tremens									1							1	0'009	0'008
Alcohol { b. Intemperance ...									2	1	3			1		7	0'066	0'059
Thrush ...	4															4	0'038	0'033
Totals ...	131	67	30	33	24	3	4	9	16	8	8	9	6	4	1	353	3'373	3'003
CLASS II. CONSTITUTIONAL.																		
Dropsy ...							1			1	2			2		6	0'057	0'050
Cancer ...						2	1	2	8	7	9	6	13	3		51	0'488	0'365
Mortification ...											1					1	0'009	0'008
Scrofula ...	1	1						1				1				3	0'028	0'025
Tabes Mesenterica ...	9	7	3	2	1											22	0'210	0'177
Phthisis ...	2	1				1	4	12	53	65	46	29	11	2	13	239	2'285	1'784
Hydrocephalus ...	20	9	5	7	4	2			2							49	0'468	0'416
Totals ...	31	19	8	9	8	6	15	24	67	56	41	18	3	25	5	335	3'203	2'847
CLASS III. LOCAL.																		
Cephalitis ...					2				1	2						5	0'047	0'042
Apoplexy ...									2	1	5	5		10	1	26	0'248	0'221
Paralysis ...	1						1		4	8	5	1	11	10	2	44	0'420	0'373
Epilepsy ...				2		1			1				1			5	0'086	0'076
Convulsions ...	133	18	3	1	3				1	1		1				155	1'481	1'317
Brain Disease, &c. ...	4	3	2	4	6	4	2	5	3	8	2	4	2	6	3	53	0'506	0'450
Pericarditis ...											1	1				2	0'009	0'008
Aneurism ...								1	1	1						3	0'028	0'025
Heart Disease, &c. ...		1			2	7	4	4	10	28	32	10	13	21	6	138	1'319	1'172
Bronchitis ...	1	1		3	1						1			1		7	0'066	0'059
Bronchitis ...	85	21	12	4	1		3		2	8	13	11	2	35	15	213	2'036	1'808
Pleurisy ...	1	1				1	1		2	3				3	1	13	0'124	0'101
Pneumonia ...	43	26	14	7	2	3	4	5	20	22	25	7	3	13	7	196	1'874	1'657
Asthma ...										1	1	1				3	0'057	0'050
Lung Disease, &c. ...	7	2	1	1	2		2	5	1	5	1	1		9	2	37	0'353	0'305
Gastritis ...	1	1				1					1			2		5	0'066	0'059
Enteritis ...	2	1						1								4	0'124	0'101
Peritonitis...	2	1		3	3		3	1	2	3	2			2		22	0'210	0'186
Ascites ...											1	1				2	0'009	0'008
Ulceration of Intestines ...						1										1	0'009	0'008
Hernia ...												1	2			3	0'028	0'025
Ileus ...				1									2	1		4	0'038	0'033
Intussusception ...	1	2						1		1						5	0'047	0'042
Stricture of Intestines ...									1		1		1	2		5	0'053	0'042
Stomach Disease, &c. ...		1	1	1				4	1	2		1	3	1		15	0'143	0'127
Hepatitis ...											1					1	0'009	0'008
Jaundice ...	3											1				4	0'038	0'033
Liver Disease &c. ...								1	4	8	4	2	1	6		20	0'191	0'169
Nephritis ...							1		2	2	1	1		3		10	0'095	0'084
Bright's Disease (Nephria) ...					2				1	7	11	9	1	9		40	0'382	0'339
Diabetes ...											1	1				2	0'019	0'017
Cystitis ...	1								2	1	1			3	1	9	0'086	0'076
Kidney Disease, &c. ...					1	1			2	2				2		8	0'076	0'069
Ovarian Dropsy ...											2					2	0'019	0'017
Joint Disease, &c. ...															1	6	0'057	0'050
Ulcer ...						1	1									1	0'009	0'008
Skin Disease, &c. ...	1															1	0'009	0'008
Totals ...	295	78	34	26	29	22	19	23	73	98	117	54	24	148	45	986	10'384	9'230
CLASS IV. DEVELOPMENTAL.																		
Premature Birth ...	66															66	0'631	0'560
Spina Bifida ...	5															5	0'047	0'042
Other Malformations ...	7															7	0'066	0'059
Teethings ...	6	3	1													10	0'095	0'084
Chilitis (Metria) ...							2	3	12	3						20	0'191	0'169
Old Age ...														31	44	89	0'851	0'750
Atrophy and Debility ...	153	8		1		1	1		1	1	1			1		169	1'615	1'436
Totals ...	231	11	1	1		1	3	3	13	4	1	1		32	44	360	3'442	3'059
CLASS V. VIOLENT DEATHS																		
Fractures and Contusions ...	2	1	1		6	2	3	6	5	6	7	2		8		44	0'420	0'373
Burns and Scalds ...		1	1	2	1		1	1	1	1	1	3				13	0'124	0'126
Poison ...				1												1	0'009	0'008
Drowning ...		1	1			1	1	4	5	8	3	1		1		26	0'248	0'221
Suffocation ...	6					1				1				1		9	0'095	0'084
Otherwise ...	1						1							1		2	0'019	0'016
Murder and Manslaughter ...	1								1							2	0'019	0'016
Gunshot Wounds ...													1			1	0'009	0'008
Cut, Stab ...								1			1			2		4	0'038	0'033
Drowning ...											1					1	0'009	0'008
Hangings ...												1		1		2	0'019	0'016
Totals ...	11	5	2	3	9	4	9	13	14	12	11	7		8		108	1'032	0'917
Sudden Deaths (cause unascertained)	2		1					1								3	0'028	0'025
Causes not classified or disturbed ...	14							3	4	3	6	1		4		35	0'334	0'297
Totals ...	15		1					4	4	3	6	1		4		38	0'363	0'322

Form A. Deaths during the Year 1887, in the Urban Sanitary District of Cardiff.

CLASSIFIED ACCORDING TO DISEASES, AGES AND LOCALITIES, AND SHOWING ALSO THE POPULATION OF SUCH LOCALITIES, AND THE BIRTHS THEREIN DURING THE YEAR.

Names of Localities adopted for the purpose of these Statistics; public institutions being shown as separate localities.	Population at all Ages.		Registered Births.	Mortality from all causes, at subjoined Ages.							Mortality from subjoined causes, distinguishing Deaths of Children Under Five Years of Age.																			
	Census 1881.	Estimated to middle of 1887.		At all ages.	Under 1 year.	1 and under 5.	5 and under 15.	15 and under 25.	25 and under 60.	60 and upwards.		Small-pox.	Measles.	Scarlatina.	Diphtheria.	Croup (not Spasmodic).	Whooping Cough.	Continued Fevers. Typhus.	Continued Fevers. Enteric or Typhoid.	Continued Fevers. Other or Doubtful.	Diarrhœa and Dysentery.	Rheumatic Fever.	Erysipelas.	Pyæmia.	Puerperal Fever.	Phthisis.	Bronchitis, Pneumonia and Pleurisy.	Heart Disease.	Injuries.	All Other Diseases.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	24.	25.	26.	27.	29.	30.	31.	32.	33.
Public Institutions. Cardiff U.S.A. ...	85,378	104,580	4277	1987	693	311	95	100	520	268	Under 5	2	59	7	11	18	45	...	1	1	85	...	1	...	...	3	215	1	4	551
											5 upwds	4	3	1	9	8	...	...	14	...	21	5	4	...	1	151	177	121	16	448
Union	...	...	...	189	21	5	1	9	59	94	Under 5	...	...	...	...	...	2	...	...	...	4	...	...	...	...	...	2	...	...	18
											5 upwds	...	...	...	...	...	...	...	...	...	2	...	...	...	...	51	20	8	...	82
Infirmary	...	...	...	76	...	6	10	11	43	6	Under 5	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
											5 upwds	...	...	...	...	...	...	...	1	...	...	...	...	2	...	2	4	7	14	40
Hamadryad Hospital Ship	...	...	...	28	...	...	1	6	20	1	Under 5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
											5 upwds	5	...	...	...	...	...	...	...	...	...	...	...	...	...	3	3	1	10	6
Totals ...	85,378	104,680	4277	2280	714	322	107	126	642	369	Under 5	2	59	10	11	18	47	...	1	1	89	...	1	...	...	3	217	1	4	572
											5 upwds	9	3	1	9	8	...	...	15	...	23	5	4	2	1	207	204	137	40	576

Form B. New Cases of Sickness coming to the knowledge of the Medical Officer of Health during the Year 1887, in the Urban Sanitary District of Cardiff.

(B)

CLASSIFIED ACCORDING TO LOCALITIES AND DISEASES.

NAMES OF LOCALITIES.		New Cases of Sickness in Persons belonging to the District, distinguishing those in Children under Five Years of Age.													Other Diseases, such as Chicken Pox, or Pneumonia, which the Medical Officer of Health thinks well to record.	
			Small-pox.	Measles.	Scarlatina.	Diphtheria.	Croup (not Spasmodic)	Whooping Cough.	Continued Fevers. Typhus.	Continued Fevers. Enteric Typhoid.	Continued Fevers. Other Doubtful.	Diarrhœa and Dysentery.	Rheumatic Fevers.	Erysipelas.	Pyæmia	Ague.	
1.		12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	24.	25.	26.	28.	Phthisis.	Pn., Br., Pl.
Workhouse, In	800	Under 5	...	...	...	...	...	14	...	...	...	7	...	...	...	...	...	6
		5 upwds	...	...	...	...	...	...	...	3	...	17	10	12	...	...	70	27
,, Out	4852	Under 5	...	290	18	...	18	102	1	12	5	101	...	...	...	...	...	22
		5 upwds	15	48	6	12	...	42	1	35	...	179	128	41	...	20	127	574
Infirmary, In	213	Under 5	...	...	3	...	1	...	...	1	...	...	...	...	...	...	...	3
		5 upwds	...	...	1	...	...	...	...	3	...	...	30	4	...	...	15	33
,, Out	*	Under 5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		5 upwds	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hamadryad Seaman's Hospital, In	140	Under 5	...	...	...	...	..	...	...	...	...	...	...	...	...	..	...	...
		5 upwds	33	2	...	...	...	...	...	...	...	14	41	1	2	2	8	48
,, ,, ,, Out	*	Under 5	...	...	...	...	...	...	...	...	...	...	...	...	...	..	..	...
		5 upwds	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals ...		Under 5	...	290	21	...	19	116	1	13	5	108	...	...	...	...	...	31
		5 upwds	48	50	7	12	...	42	1	41	...	210	209	58	2	22	220	682

* No reliable Returns kept.